On average mainstem and tributary spawners mill in-river for 33 days up to 67 days.[21] [22]

Bendock, FMS 92-2 pg 41:

The duration of time between tagging and death (stream life) was calculated for 282 fish that were judged to have spawned (Table 16). Mean stream life was 33 days (SE = 0.609) and ranged from 8 to 67 days. Stream life was significantly longer for tributary spawners (mean = 35.1 d, SE = 0.7428) and consequently for early-run fish, than for mainstem spawners (mean = 30.3 d, SE = 0.9846). Fish that spawned in Benjamin Creek had the longest stream life (41.5 d) and mainstem spawners had the shortest (30.5 d).

Reimer RIR No 2A13-06 pg 36:

early bound on the date when spawning could have begun. Chinook salmon with spawning destinations within the Kenai River mainstem began displaying site fidelity to their eventual spawning area as early as late June although in most years and river sections, no site fidelity was displayed until July. The median date for radiotagged Chinook salmon to begin displaying site fidelity to their eventual spawning area varied between 12 and 21 August for all years and river sections. All radiotagged Chinook salmon with a mainstem spawning destination displayed site fidelity to their eventual spawning area by early September. Site fidelity lasted for 6–63 days (median 14 days)[8]. Spawning is assumed to have occurred toward the end of each fish's site

Bendock, FDS 91-39, pg 37:

Management objectives for the chinook salmon fishery change on 1 July as late-run fish begin to enter the river. To escape the inriver recreational fishery, early-run chinook salmon must either enter tributary drainages or continue moving upstream beyond rkm 80 in the mainstem. Twenty-two percent of the radio-tagged early-run fish never exited the area open to sport fishing. On 2 July, 70% of the tagged early-run fish that were ultimately judged to be spawners remained available to harvest in the lower 80 km of mainstem and 33% were still vulnerable to harvest on 14 July. Thus, early-run salmon remain vulnerable to harvest throughout much of the late run.

[21] Bendock, T., "Mortality and Movement Behavior of Hooked-and-Released Chinook Salmon in the Kenai River Recreational Fishery, 1989-1991," 1992. Fishery Manuscript No. 92-2, pg 41, 46

[22] Reimer, A., "Migratory Timing and Distribution of Kenai River Chinook Salmon, 2010-2013, A Report to the Alaska Board of Fisheries 2014." RIR No. 2A13-06 pg 36 (site fidelity up to 63 days)

The Bendock catch-and-release mortality study estimated 70% of early-run Kings were available to in-river, sportfish harvest in July.[23]

Bendock, FMS 92-2 pg 41:

The duration of time between tagging and death (stream life) was calculated for 282 fish that were judged to have spawned (Table 16). Mean stream life was 33 days (SE = 0.609) and ranged from 8 to 67 days. Stream life was significantly longer for tributary spawners (mean = 35.1 d, SE = 0.7428) and consequently for early-run fish, than for mainstem spawners (mean = 30.3 d, SE = 0.9846). Fish that spawned in Benjamin Creek had the longest stream life (41.5 d) and mainstem spawners had the shortest (30.5 d).

Reimer RIR No 2A13-06 pg 36:

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Bendock, FDS 91-39, pg 37:

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[23] Bendock, T., "Hook-and-Release Mortality in the Kenai River Chinook Salmon Recreational Fishery," 1991. FDS 91-39 pg 37

A 2010-2013 tagging study showed that as late as July 31, more than 30% of tagged fish detected in open-to-fishing waters above Slikok Creek on the Kenai River were early-run, mainstem spawners. [24]

Reimer: 30% early-run, July 31, 2013, Upstream:

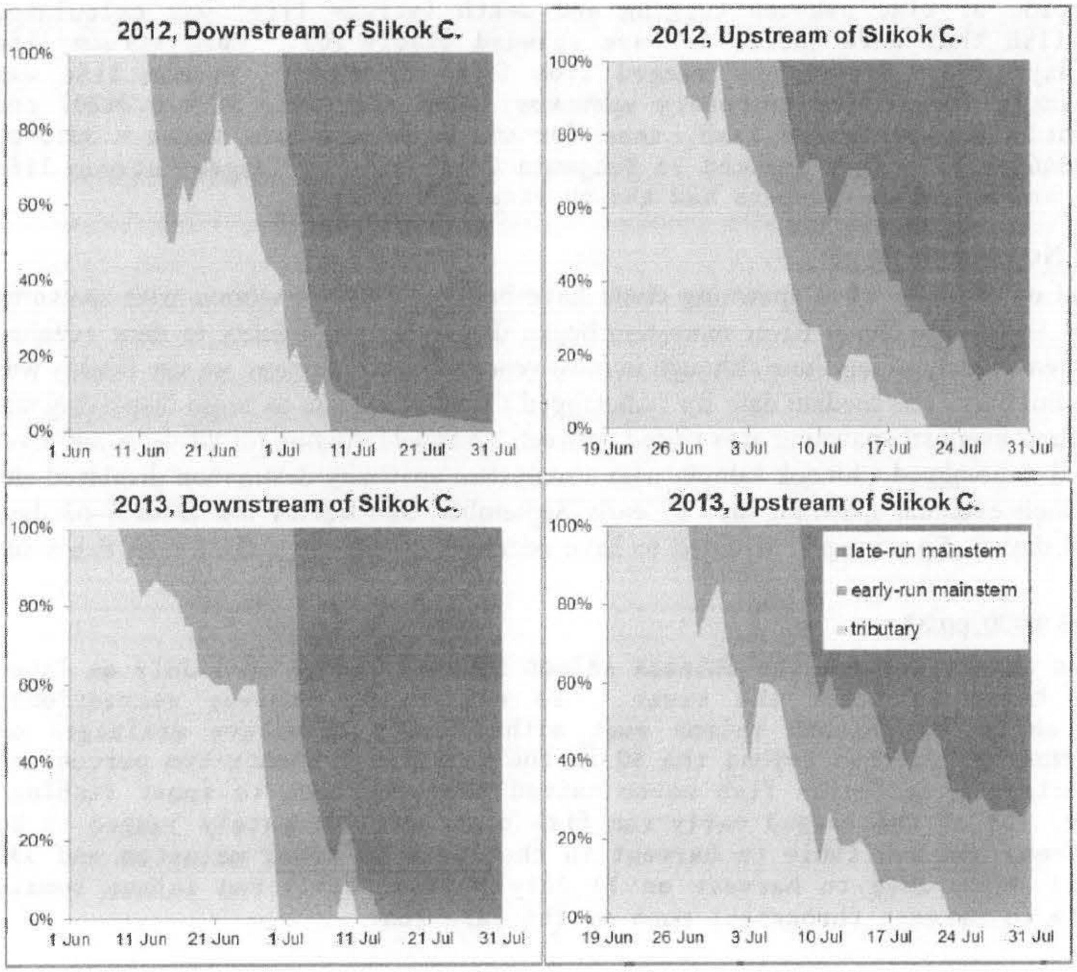

Figure 14.–Proportion of radiotagged Chinook salmon detected in the Kenai River Chinook salmon sport fishery upstream and downstream of Slikok Creek by assigned spawning destination and entry timing, 2012 and 2013.

Note: "Upstream of Slikok Creek" excludes the closed and restricted fishing areas around Slikok Creek, Centennial Park, Funny River, Morgan's Landing, and Killey River plus the Kenai River upstream of and including Skilak Lake.

46

[24] Reimer, A., "Migratory Timing and Distribution of Kenai River Chinook Salmon, 2010-2013, A Report to the Alaska Board of Fisheries 2014." RIR No. 2A13-06 pg 46 (early-run mainstem fish through July)

Over 90% of the early-run King return to the river was caught by sportfishermen in 1988. 5,946 (73% of escapement) of those were caught-and-released.[25]

Bendock, pg 2:

Between 1986 and 1991, an estimated 48,280 chinook salmon (32% of the catch) were released by anglers (Table 1). In the early-run component of the 1988 fishing season, over 90% of the total chinook salmon return to the river was caught. The released component of that catch (5,946 fish) represented 73% of the estimated escapement. The fate of these hooked-and-released fish was

[25] Bendock, T., "Mortality and Movement Behavior of Hooked-and-Released Chinook Salmon in the Kenai River Recreational Fishery, 1989-1991" 1992. pg 2 (90% catch)

PRODUCTIVITY

Each run is composed of Kings of mixed parent (brood) years from 2 to 8 years earlier.

Jacks may be defined as young, sexually mature 3 or 4 year-old males that return to spawn earlier than the females of their brood year.[26]

Heredity 72 (1994) 146–154

Received 3 Ju

Genetic, environmental and interaction effects on the incidence of jacking in *Oncorhynchus tshawytscha* (chinook salmon)

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Jacking in chinook salmon, *Oncorhynchus tshawytscha,* is defined as sexual maturation of males after at least 1 year in sea water, occurring 1 year prior to any of the females of the same cohort. A

[26] Daniel, D., "Genetic, environmental and interaction effects on the incidence of jacking in Oncorhynchus tshawytscha (chinook salmon)," 1994. *Heridity* 72 (1994) 146-154 pg 1 (def: jack)

In a 1984 study, 4 year-old early-run Kenai Kings were 27 inches in length and smaller, averaging 22 inches in total length.[27]

Hammarstrom, pg 100:

Table 14. Summarized Age/Weight/Length Data from Readable Scales Collected from Chinook Salmon Taken in the Recreational Fishery on the Kenai River, 1984.

Age Class / Brood Year	1.2 / 1980	1.3 / 1979	1.4 / 1978	1.5 / 1977	Total
			Early Run		
Number	10	81	180	20	291
Percent	3.4	27.8	61.9	6.9	100.0
Length Range (mm)*	420-690	660-990	790-1,190	950-1,210	420-1,210
Mean Length (mm)*	556	798	993	1,071	929
Mean Weight (kg)	3.5	9.6	18.2	22.1	15.6
			Late Run		
Number	43	78	305	62	488
Percent	8.8	16.0	62.5	12.7	100.0
Length Range (mm)*	560-780	670-1,010	810-1,220	970-1,295	560-1,295
Mean Length (mm)*	670	860	1,059	1,127	1,000
Mean Weight (kg)	5.9	12.4	22.1	25.7	22.1

* Lengths are mid-eye to fork of tail.

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1984 Age-Length Correlation in Kings (Mid-eye to tail-fork lengths)

EARLY RUN:	LATE RUN:
420 mm = 16.5" 4 yr-old (1:2)	560 mm = 22" 4 yr-old (1:2)
690 mm = 27" 4 yr-old (1:2)	780 mm = 31" 4 yr-old (1:2)
Mean Length = 22"	Mean Length = 26.4"
Mean Weight = 7.7lbs	Mean Weight = 13lbs
660 mm = 26" 5 yr-old (1:3)	670 mm = 26" 5 yr-old (1:3)
990 mm = 39" 5 yr-old (1:3)	1,010 mm = 40" 5 yr-old (1:3)
Mean Length = 31.3"	Mean Length = 33.9"
Mean Weight = 21.2lbs	Mean Weight = 27.3lbs
790 mm = 31" 6 yr-old (1:4)	810 mm = 32" 6 yr-old (1:4)
1,190 mm = 47" 6 yr-old (1:4)	1,220 mm = 48" 6 yr-old (1:4)
Mean Length = 39.1"	Mean Length = 41.7"
Mean Weight = 40.1lbs	Mean Weight = 48.7"
950 mm = 37" 7 yr-old (1:5)	970 mm = 38" 7 yr-old (1:5)
1,210 mm = 47.6" 7 yr-old (1:5)	1,295 mm = 51" 7 yr-old (1:5)
Mean Length = 42.2"	Mean Length = 44.4"
Mean Weight = 48.7lbs	Mean Weight = 56.7lbs

[27] Hammarstrom, S., "Annual Performance Report for Kenai Peninsula Chinook and Coho Salmon," 1984. pg 100 (age-length table)

Kings have narrow-sense (strongly inherited) heredity traits including 1) age-at-maturity and 2) size-at-age.[28]

Hankin, pg 1:

consequence of troll fishery harvest of immature salmon. Results suggest that (a) heritability of age of maturity is relatively high in this species (calculated h2 were 0.49–0.57 and 0.39–0.41 for males and females, respectively), (b) inheritance of age of maturity of females appears to be independent of age of male parent, and (c) for a given parental age, "faster-growing" progeny generally mature at younger ages, but (d) progeny from older parents are not generally smaller at age than progeny from younger parents. Inheritance of age of maturity therefore cannot be a simple reflection of inheritance of growth rate. We tentatively propose the

pg 348:

Ricker (1972) summarized the then available information on inheritance of age of maturity in chinook salmon based on such "age-specific mating experiments" (see Ellis and Noble 1960, 1961; Donaldson and Menasveta 1961; Donaldson and Bonham 1970). He concluded that the genetic influence on age of maturity is strong and that male and female ages are to some extent determined independently. Generally, older (and larger) parents produced progeny that matured at older ages and larger sizes than did younger (and smaller) parents.

Inheritance of age of maturity of chinook salmon has substantial importance for fishery management because size-selective commercial and sport fisheries shift the age composition of spawning runs toward younger and smaller fish. Rutter

[28] Hankin, D., "Evidence for Inheritance of Age of Maturity in Chinook Salmon (Oncorhynchus tshawytscha)," 2011. Canadian Journal of Fisheries and Aquatic Sciences 50(2):347-358 pg 1, 348

Older, larger female Kings are more productive and may produce more than 4 times more eggs than smaller, younger Kings.[29 30]

pg 491:

E. Fecundity

Chinook salmon fecundity varies by stock and the size of the female; however, northern stocks generally produce more eggs. In Alaska, the number of eggs ranges from 4,242 to 17,255 per female (Morrow 1980, Burger et al. 1983).

491

(Morrow, 1980, Burger, 1983)
Morrow, J.E., "The freshwater fishes of Alaska," 1980.
Burger, C.V., "Salmon investigations in the Kenai River, Alaska, 1979-1981," 1983.

Hard, pg 774:

captures a broad range of fish sizes. Removal of the largest fish will have a disproportionate impact because of the contribution of their high fertility to population growth rate (Birkeland and Dayton 2005; Hutchings and Fraser

[29] ADF&G, "Chinook Salmon Life History and Habitat Requirements," 1985. pg 491 (4 times)
[30] Hard, J., "Genetic Consequence of Size-Selective Fishing: Implications for Viability of Chinook Salmon in the Arctic-Yukon-Kuskokwim Region of Alaska," 2009. pg 774 (disproportionate impact)

In 1988, ADF&G estimated an early-run return of 57 8 year-old Kenai Kings, 1,413 7 year-olds, and 5,001 6 year-olds.[31]

pg 14 1986 Age classes

Table 2. Estimates by age class of the total number of early-run Kenai River chinook salmon, 1986-1990.

Year	Age Class														Total
	0.2	0.3	0.4	0.5	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	
1986															
Estimated Number	0	0	0	0	0	4,554	11,730	8,880	1,908	0	0	0	0	7	27,080
SE						1,755	4,239	3,195	703					19	9,799
1987															
Estimated Number	0	0	0	0	0	386	9,653	14,883	589	0	0	0	31	101	25,643
SE						125	2,080	3,732	226				31	56	5,928
1988															
Estimated Number	0	0	0	0	0	358	3,088	15,077	2,279	57	0	0	21	0	20,880
SE						97	260	335	237	40			21		0
1989															
Estimated Number	0	0	0	0	0	759	2,853	12,789	1,665	0	0	0	0	0	18,065[a]
SE						137	250	311	195						0
1990															
Estimated Number	0	0	0	0	0	800	2,818	6,540	648	0	0	0	0	0	10,808[b]
SE						133	214	241	114						0

[a] Includes 73 fish harvested in educational gill nets.
[b] Includes 40 fish harvested in educational gill nets.

[31] Sonnichsen, S., "Estimates of Total Return by Age for Kenai River Chinook Salmon, 1986-1990," 1991. Fishery Data Series No. 91-69 pg 14 (1988 8 year-olds)

The nest ("redd") of a large female King may be as deep as 2.5 feet and larger than 150 square feet.[32]

pg 1688 redd depths up to 80 cm

"Riverine egg salmon depths: review of published data and implications for scour studies," by Paul Devries, 1997.

Table 1 (*continued*).

Species/authors	Datum[a]	Portion of pocket[a]	Depth (cm) Mean	*n*	Range	Location	Method	Comments[b]
Shepard et al. (1984*a*)	Overlying gravel	Top			>14	Montana	McNeil	
Shepard et al. (1984*b*)	Overlying gravel	Top			10–20	Montana		
Heimer (1965)					8–15	Idaho		Cited in Shepard et al. 1984*b*
Allan (1980)					3–18	Alberta		Cited in Shepard et al. 1984*b*
Chinook salmon								
Miller (1985)	Original level	Bottom	30			Washington		General criterion based in part on own data
Hobbs (1937)	Original level	Discrete eggs			30–41	New Zealand	Excavation	Considered 99% of eggs to be within this layer
Vronskii and Leman (1991)	Original level	Discrete eggs			21–50	USSR		Depths at which eggs reportedly found most frequently
Hobbs (1937)	Original level	Top			15–46	New Zealand	Observation	Redd excavation depths
Hobbs (1937)	Original level	Top			>20	New Zealand	Excavation	Eggs usually expected below this depth
Burner (1951)	Original level	Top	22–27		5–51	Washington	Observation	Deepest part of redd measured at different time intervals
Briggs (1953)	Original level	Top		2	28–36	California	Observation	Depth of pit prior to egg deposition
Scott and Crossman (1973)	Original level	Top			<31	Canada		Redd excavation depth; general criterion
Miller (1985)	Original level	Top	15			Washington		General criterion based in part on own data
Vronskiy (1972)	Overlying gravel	Bottom	53	10	40–80	USSR	Excavation	Maximum depths in 10 mounds
Chapman et al. (1986)	Overlying gravel	Bottom	29	54	19–37	Columbia River	Probing	May be underestimates according to authors
Hawke (1978)	Overlying gravel	Center	36	7	32–41	New Zealand	Excavation	Stranded redds; redd means
Hawke (1978)	Overlying gravel	Center			18–43	New Zealand	Excavation	Stranded redds; all data
Briggs (1953)	Overlying gravel	Top	28	8	20–36	California	Excavation	
Vronskiy (1972)	Overlying gravel	Top	21	10	10–46	USSR	Excavation	Minimum depths in 10 mounds
Chapman et al. (1986)	Overlying gravel	Top	19	116	10–33	Columbia River	Excavation	Depth to first embryos encountered
Chum salmon								
Bruya (1981)	Original level	Bottom		4	20–40	Washington	Freeze	Gravel disturbance by spawners (control); RFL = 65–74 cm
Burner (1951)	Original level	Top	22		8–43	Washington	Observation	Deepest part of redd measured at different time intervals
Scott and Crossman (1973)	Original level	Top			<41	Washington		Redd excavation depth; general criterion
Salo (1991)	Original level	Top			20–40	North America		General criterion for redd pit depth prior to egg deposition
Montgomery et al. (1996)	Original level	Top	23	40	10–49	Washington	Excavation	
Bruya (1981)	Overlying gravel	Discrete eggs		4	10–30	Washington	Freeze	93% of eggs recovered (control); RFL = 65–74 cm
Tripp and Poulin (1986)	Overlying gravel	Discrete eggs		34	0–45	B.C.	Probing	
Tripp and Poulin (1986)	Overlying gravel	Discrete eggs			10–35	B.C.	Probing	Majority of eggs (>90%)
L. Powell (in Scrivener and Brownlee 1989)	Overlying gravel	Discrete eggs			5–20	B.C.	Freeze	Cited personal communication
K.V. Koski (in Scrivener and Brownlee 1989)		Discrete eggs			10–50	Washington		Cited personal communication
K.V. Koski (in Scrivener and Brownlee 1989)		Discrete eggs	22			Alaska		Cited personal communication
Bazarkin (1990)		Discrete eggs			30–40	USSR		
Meehan and Bjornn (1991)		Discrete eggs			15–30	North America		General criterion

32 deVries, P., "Riverine salmon egg burial depths: review of published data and implications for scour studies," 1997. Can. J. Fish. Aquat. Sci Vol 54 pg 1688 (redd depths)

Because age-at-maturity is strongly inherited, young jacks return more jacks.[33] Larger, older Kings at maturity beget larger, older Kings at maturity. [34] [35]

pg 348:

1970). He concluded that the genetic influence on age of maturity is strong and that male and female ages are to some extent determined independently. Generally, older (and larger) parents produced progeny that matured at older ages and larger sizes than did younger (and smaller) parents.

Inheritance of age of maturity of chinook salmon has substantial importance for fishery management because size-selective commercial and sport fisheries shift the age composition of spawning runs toward younger and smaller fish. Rutter

pg 355:

maturity of progeny. The most meaningful estimates of heritability from these experiments are probably those based on freshwater returns of mature progeny from the 1974 brood year, adjusted for ocean fishery interceptions of immature fish (i.e. hypothetical unexploited age composition of mature progeny, Table 6). These estimates, 0.57 and 0.40 for males and females, respectively, are similar to those reported by Gjerde (1984) and Gjerde and Gjedrem (1984) for Atlantic salmon (*Salmo salar*) (0.39 for males and 0.48–0.49 for females) (see also Gjedrem 1985) and by Gall et al. (1988) for rainbow trout (*Oncorhynchus mykiss*) (0.38) (see also Tipping 1991). Iwamoto et al. (1984) found that tendency for males to mature as jacks was also strongly dependent on male parent age in coho salmon

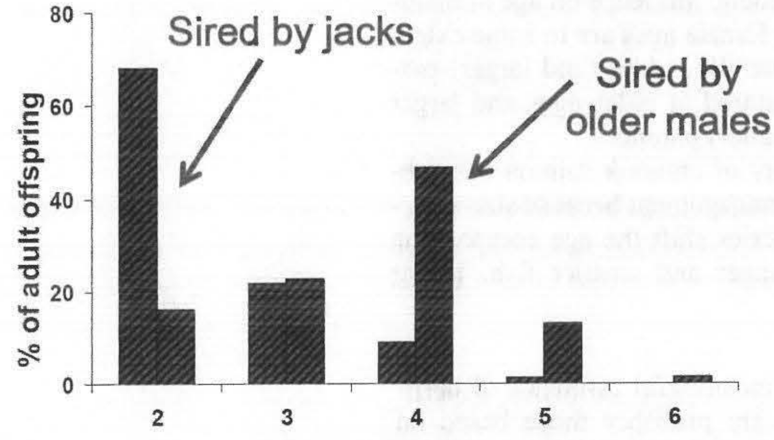
Continued next page...

33 http://courses.washington.edu/fish450/Lecture%20PDFs/Salmon_age_and_size_at_maturity.pdf Roni, P., "Salmon age and size at maturity: Patterns and processes." UW-SAFS-Fish_450 pg 38

34 Hankin, D., "Evidence for Inheritance of Age of Maturity in Chinook Salmon (Onchorhynchus tshawytscha)," 1993. pg 348 ("generally,..."), pg 354 (tables)

35 Hard, J., "Early Male Maturity in Two Stocks of Chinook Salmon (Oncorhynchus Tshawytscha) Transplanted to an Experimental Hatchery in Southeastern Alaska," 1985. pg 357

Females mated with jack Chinook salmon produced more jacks and fewer old males than females mated with older males



Hankin et al. 1993.

Hard pg 357:

The difference in rates of early male maturity observed between the two stocks of chinook salmon supports previous findings that male age-at-maturity in this species is strongly heritable. The presence of early-maturing

Hankin, 1993, pg 354 (white = male, black = female):

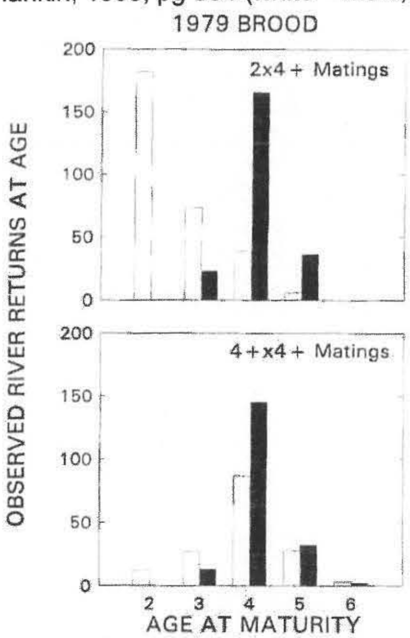


FIG. 3. Observed age-and sex-specific returns of fall chinook salmon to Elk River from 1979 brood year matings of age 2 males with age 4–6 females (2 × 4+ matings) and of age 4–6 males with age 4–6 females (4+ × 4+ matings). Release group sizes were 71 943 and 73 742 fish for the 2 × 4+ and 4+ × 4+ groups, respectively. Observed returns of males (open bars) at ages 2–6 were 182, 74, 39, 6, and 0, respectively, for 2 × 4+ matings and 12, 27, 87, 28, and 3, respectively, for 4+ × 4+ matings. Observed returns of females (solid bars) at ages 2–6 were 0, 23, 166, 36, and 0, respectively, for 2 × 4+ matings and 0, 13, 145, 32, and 2, respectively, for 4+ × 4+ matings.

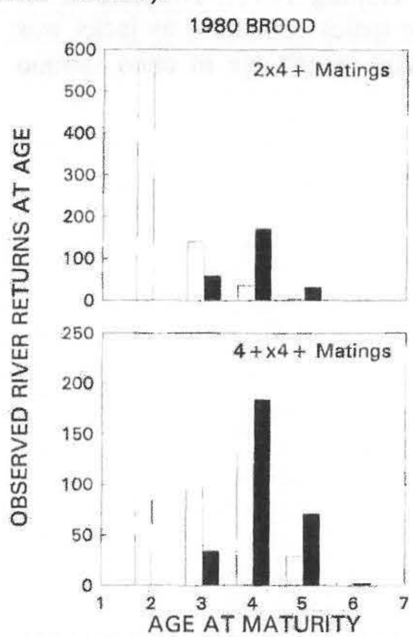


FIG. 4. Observed age- and sex-specific returns of fall chinook salmon to Elk River from 1980 brood year matings of age 2 males with age 4–6 females (2 × 4+ matings) and age 4–6 males with age 4–6 females (4+ × 4+ matings). Release group sizes were 105 084 and 114 528 fish for the 2 × 4+ and 4+ × 4+ groups, respectively. Observed returns of males (open bars) at ages 2–6 were 569, 140, 36, 4, and 0, respectively, for 2 × 4+ matings and 85, 97, 132, 29, and 3, respectively, for 4+ × 4+ matings. Observed returns of females (solid bars) at ages 2–6 were 0, 59, 170, 4, and 1, respectively, for 2 × 4+ matings and 0, 34, 184, 71, and 2, respectively, for 4+ × 4+ matings.

Changing fish population structure to younger, smaller fish can lead to decreased reproductive potential, lower reproductive rates, loss of yield, increased variability in abundance, and fishery collapse.[36]

reduction in average ages and lengths (Ricker 1981). Altering the structure of a fish population toward smaller younger fish can lead to decreased fecundity (Walsh et al. 2006), lowered reproductive rates (Venturelli et al. 2009), loss of yield (Conover and Munch 2002), increased variability in abundance (Hsieh et al. 2006), and ultimately fishery collapse (Olsen et al. 2004). The consideration of the effects of a fishery on adult Chinook salmon can be complicated by a complex population structure (Ricker 1980), environmental variability affecting fish growth and survival (Kendall and Quinn 2011), or a naturally skewed life-history population structure. Nonetheless, adult Chinook salmon returning to the Funny River display a dissimilar population structure from other Southcentral Alaska Chinook salmon populations, and appear to be heavily skewed towards smaller younger fish (Table 1; Figure 5; Roni and Quinn 1995), a classic sign of over exploitation (Ricker 1981).

[36] Boersma, J., "Abundance and Run Timing of Adult Chinook Salmon and Steelhead in the Funny River, Kenai Peninsula, Alaska," 2013. Fisheries Data Series No. 2013-4 pg 12

The energy budget required for metabolic changes necessary for living in fresh water, migration, and spawning for Kings is visibly observable in changes in color and teeth during this phase.

CONTRIBUTING CAUSES OF DECLINE

Overfishing and targeting the largest, most productive trophy Kings. Targeting large Kings contributes to "fisheries induced genetic selection" for younger, smaller, less productive returns.[37]

"Fisheries Induced Genetic Selection"

[37] "Fisheries Induced Genetic Selection," a summary of research related to fisheries induced genetic selection-related research with Chinook and other species: https://www.youtube.com/watch?v=ousioCKX_U4.

ADF&G Sportfish Division continues to sponsor a trophy (more than 55 inches total length), catch-and-keep King fishing contest even when other conservation measures are being taken.[38] [39]

ADF&G Sportfish Division endorses a "slot limit hook-and-release policy" (42-55 inches) that invites more hook-and-release mortality even on years like 2013 when early-run minimum threshholds had not be reached.[38] [39]

The slot limit policy combined with the trophy fishing contest encourages hook-and-keep retention of all the Kenai River's largest, most productive Kings (more than 55 inches long).

ADF&G Trophy Fish Program

Begich, pg 10
If the [early-run] spawning escapement is projected to be less than 5,300 fish [lower threshhold of the Optimum Escapement Goal], ADF&G can implement trophy fishing provisions that prohibit the retention of Chinook salmon less than 55 inches in total length [allowing catch-and-keep retention of Kings longer than 55 inches], or close the Kenai River to retention of all Chinook salmon. Additionally, the plan contains options that enable fishery managers to protect early-run Chinook salmon in the mainstem of the Kenai River. These include restricting the use of bait and prohibiting the retention of Chinook salmon greater than 20 inches but less than 55 inches in total length upstream of the Sterling Highway Bridge, from July 1 through July 14.

Begich, pg 14:
Because the low [2013] forecast indicated the early-run could sustain little harvest without jeopardizing achievement of the OEG, the department issued EO 2-KS-1-11-13 on May 9 restricting the early-run fishery to catch and release trophy fishing effective May 16. ...
The preliminary inseason estimated escapement was approximately 2,033
early-run Chinook salmon (Table 7).

Begich, pg 18, late-run:
By July 23 the projected escapement had declined below the SEG and
an EO (2-KS-1-43-13) was issued restricting the remainder of the river open to sport fishing for Chinook salmon to catch and release trophy fishing effective July 25 (Appendix A4).

Reimer, pg 43:

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[38] Begich, R., "2010-2012 Annual Management Report and 2013 Recreational Fisheries Overview for Northern Kenai Peninsula: Fisheries under Consideration by the Alaska Board of Fisheries, 2014," 2013. Fishery Management Report No. 13.51 pg 10 (trophy fishing); pg 14 (2013 early-run)
[39] ADF&G, "Staff Comments to the Alaska Board of Fisheries," 2014. RIR.2a.2013.04 pg 44(slot limit)

In waters of the Kenai River open to king salmon sport fishing, early-run regulations allow for the harvest of 10 king salmon less than 20 inches per day, and harvest of one king salmon per day 20 inches or greater in length and less than 46 inches or 55 inches or greater in length. Any king salmon caught that is 46 inches or longer, but less than 55 inches, must be released unharmed. The non-retention slot limit is in effect from January 1–June 30 in the Kenai River from the mouth upstream to the Soldotna Bridge and from January 1–July 14 for those waters of the Kenai River from the Soldotna Bridge upstream to the outlet of Skilak Lake.

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Continued next page ...

Reimer, pg 44 [The 46-55 inch slot was changed to 42-55 inches in 2014]:

If the spawning escapement is projected to be less than the lower the end of the OEG, the commissioner shall, by EO, restrict as necessary the taking of king salmon in the sport and guided sport fisheries in the Kenai River to achieve the OEG using one of the following methods:

(A) prohibit the retention of king salmon less than 55 inches in length, except king salmon less than 20 inches in length, downstream from the outlet of Skilak Lake through June 30, and require that upstream from the Soldotna Bridge to the outlet of Skilak Lake and in the Moose River from its confluence with the Kenai River upstream to the northernmost edge of the Sterling Highway Bridge, from July 1–July 14, only one unbaited, single-hook, artificial lure may be used and only king salmon less than

(i) 46 inches in length and 55 inches or greater in length may be retained; or

(ii) 20 inches in length and 55 inches or greater in length may be retained; or

(B) close the sport and guided sport fisheries to the taking of king salmon in the Kenai River

(i) downstream from the outlet of Skilak Lake through June 30; and

(ii) from July 1–July 14, upstream from the Soldotna Bridge to the outlet of Skilak Lake and in the Moose River from its confluence with the Kenai River upstream to the northernmost edge of the Sterling Highway Bridge.

Reimer pg 44, slot limit background:

BACKGROUND: Prior to 2002, there was no slot limit in the Kenai River king salmon sport fishery; anglers were permitted to harvest king salmon regardless of the total length of the fish. However, the department, along with the public, recognized a decline in larger, older-aged king salmon returning to the Kenai River during the early run. Although the exact cause for the decline in older king salmon during the early run is not understood, the selective harvest or exploitation of larger, ocean-age-5 fish was the only practical factor that could be directly influenced by fishery managers. Therefore, at the department's request, the Alaska Board of Fisheries (board) adopted a slot limit harvest restriction in 2002 of 40–55 inches. This restriction almost completely eliminated the harvest potential of ocean-age-5 fish, allowed the retention of rare record-sized fish, and allowed harvest of younger, smaller fish.

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Reimer pg 55:

In 2003, the board adjusted the slot limit to 44–55 inches based on a department-recommended slot limit of 45–55 inches to protect the larger, older, ocean-age-5 king salmon returning to the Kenai River during the early run. This slot limit allowed approximately 73% of the returning early-run stocks to be available for harvest. Within this slot limit, most (87%) of the ocean-age-5 fish were protected, as were about 40% of the ocean-age-4 fish in the run.

In 2008, the board relaxed the slot limit again to 46–55 inches to allow for more harvest during years of higher abundance, yet still protect ocean-age-5 king salmon. This slot limit made

In 1989, ADF&G estimated **5-day** mortality for fish hooked-and-released once was averaged 10.6% (13% males).[40]

pg 1, Bendock 1992:

early-run and 220 late-run fish that were tagged during the study. The average mortality was 7.6% for all experiments combined, and ranged from 10.6% in 1989 to 4.0% in 1991. In all experiments, small males suffered the highest

pg 1, Bendock 1989:

were recorded for each of the late-run fish that were radio-tagged. Mortality was estimated to be 13 percent for males and 7 percent for females.

[40] Bendock, T., "Hook and Release Mortality of Chinook in the Kenai River Recreational Fishery," 1990. Fishery Data Series No. 90-16 pg 1, 41 (13% males, 7% females, 10.6% average 5-day mortality)

Bendock, T., "Mortality and Movement Behavior of Hooked-and-Released Chinook Salmon in the Kenai River Recreational Fishery, 1989-1991," 1992. Fishery Manuscript No. 92-2 pg 1 (10.6% in 1989)

Although an average of 10.6% of the hooked-and-released Kings died within 5 days in the 1989 study, only 40% of Kings caught, tagged, and released actually spawned.[41]

pg 21, Bendock 1989:

Table 3. Numbers of radio-tagged chinook salmon in each classification of 5-day and ultimate fates during the late run, 1989.

Five-Day Fates		Ultimate Fates	
		Spawner	40
Survivor	63	Mortality	9
Mortality	9	Sport Harvest	22
		Set Net	9
Sport Harvest	13	Tag Net	8
Set Net	6	Education Net	1
Tag Net	7	Drop Outs	7
Education Net	1	Uplost	3
Unknown	1	Unknown	1
Total	100	Total	100

pg 37, Bendick 1989:

A total of 40 out of 100 radio-tagged fish were ultimately classified as spawners. The sample of spawning fish was comprised of 15 females and 25 males that ranged in length from 560 mm to 1,130 mm and averaged 910 mm. The

[41] Bendock, T., "Hook and Release Mortality of Chinook in the Kenai River Recreational Fishery," 1990. Fishery Data Series No. 90-16 pg 21, 37 (40% spawn)

Over three years of study, the 1989-91 average early-run catch-and-release **5-day mortality** was measured at 7.6%.[42]

pg 1, Bendock 1992:

early-run and 220 late-run fish that were tagged during the study. The average mortality was 7.6% for all experiments combined, and ranged from 10.6% in 1989 to 4.0% in 1991. In all experiments, small males suffered the highest

[42] Bendock, T., "Mortality and Movement Behavior of Hooked-and-Released Chinook Salmon in the Kenai River Recreational Fishery, 1989-1991," 1992. Fishery Manuscript No. 92-2 pg 1 (7.6% average 5-day mortality, 1989-1991)

Out-migration. In 1989, in addition to 10.6% 5-day mortality, another 16% out-migrated from the Kenai river after catch-and-release, returning to the ocean where they were caught or otherwise disappeared.[43]

pg 21, Bendock 1989 (9 Set Net + 7 "Drop Outs" = 16/100 = 16%):

Table 3. Numbers of radio-tagged chinook salmon in each classification of 5-day and ultimate fates during the late run, 1989.

Five-Day Fates		Ultimate Fates	
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Tag Net	7	Drop Outs	7
Education Net	1	Uplost	3
Unknown	1	Unknown	1
Total	100	Total	100

[43] Bendock, T., "Hook and Release Mortality of Chinook in the Kenai River Recreational Fishery," 1990. Fishery Data Series No. 90-16 pg 21 (16% out-migration)

A late-run 2010 tagging study resulted in 18% "drop-outs" or Kings that out-migrated the Kenai River after handling.[44]

Reimer, pg 17:

Table 4.–Fate of radiotagged Kenai River Chinook salmon by tagging event, 2010.

		2010					
		RM 8.5, midriver		RM 8.5, tagging		Total	
Run	Fate	N	%	N	%	N	%
Early run							
	Drop-out	15	10%	2	3%	17	8%
	Regurgitate	23	16%	6	9%	29	13%
	Censor	51	35%	38	55%	89	41%
	Migrant	57	39%	23	33%	80	37%
	Total	146		69		215	
Late run							
	Drop-out	6	18%			6	18%
	Regurgitate	13	38%			13	38%
	Censor	9	26%			9	26%
	Migrant	6	18%			6	18%
	Total	34				34	
Totals							
	Drop-out	21	12%	2	3%	23	9%
	Regurgitate	36	20%	6	9%	42	17%
	Censor	60	33%	38	55%	98	39%
	Migrant	63	35%	23	33%	86	35%
	Grand total	180		69		249	

[44] Reimer, A., "Migratory Timing and Distribution of Kenai River Chinook Salmon, 2010-1013, a Report to the Alaska Board of Fisheries 2014," 2013. Regional Information Report No. 2A13-06, pg 17 (18% dropouts)

Effective hook-and-release mortality. Adding out-migration following catch-and-release to 5-day mortality amounts to a 1989 "effective mortality" of only once-caught-and-released Kings of up to 27%.

10.6% 5-day mortality (1989)
\+ 16% out-migration ("drop-outs" in 1989)
26.6% rounds to 27%

Add twice-hooked-and-released mortality to "effective mortality." In the 1989 study, 57% of Kings twice-hooked-and- released did not survive to spawn.[45]

Bendock, 1989, pg 41 (4/7 = 57%):

All of the chinook salmon used in this study were hooked and released at least once, and 22 of these fish (the sport harvested component) were angled at least twice. We confirmed additional hook and release events for 7 fish. One of these fish had tackle in its jaw from a previous event when we caught and tagged it, and the others were caught, released, and reported to us by recreational anglers. Three of these multiple recaptures survived to spawn, while one each of the remaining fish was a sport harvest, drop-out, set net, and tag net fate. A fish that was caught and radio-tagged on 27 July had

[45] Bendock, T., "Hook and Release Mortality of Chinook in the Kenai River Recreational Fishery," 1990. Fishery Data Series No. 90-16 pg 41 (twice-hooked 57% mortality)

According to ADF&G, in the related 1990 tagging study, Kings twice-hooked-and- released had half the survival rate and three times the river exodus, out-migration rate.[46]

Bendock 1990, pg 48:

> All of the chinook salmon used in this study were hooked and released at least once, and 43 of these fish (the sport harvested component) were hooked at least twice. Anglers reported additional hook-and-release events for 14 fish during the 2 years of study; thus, nearly 20% of the fish in this study were hooked multiple times. The proportion of fish in this group that spawned was half of the overall rate, while the proportion of drop outs was three times as high. Additional hooking events and subsequent injuries may explain the abrupt downstream movements we observed in some fish that had penetrated several kilometers upstream. Furthermore, as catch rates increase in the sport fishery, mortality may also increase due to cumulative injury from multiple hooking events.

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[46] Bendock, T., "Hook-and-Release Mortality in the Kenai River Chinook Salmon Recreational Fishery," 1991. Fishery Data Series No. 91-39 pg 48 (twice-hooked and more)

Disproportionate fishing pressure. Because the Kenai River downstream of the Soldotna Bridge is the most heavily utilized mainstem spawning area in both historical and recent ADF&G data, closures upstream of Slikok Creek have not conserved mainstem spawning Kings in proportion to abundance.[47]

Reimer, RIR.2A.2013.06 pg 55:

just below Slikok Creek (RM 18.5). Because the Kenai River downstream of the Soldotna Bridge (RM 21) is the most heavily utilized mainstem spawning area in both historic and recent data (Table 2 and Tables 11–12), closures upstream of Slikok Creek have little conservation value for the largest spawning aggregate, and will fail to conserve mainstem spawning Chinook salmon in proportion to abundance. This situation is illustrated for 2012 and 2013 in Figure 20. During both seasons, conservation measures enacted downstream of Slikok Creek would more effectively conserve mainstem spawning Chinook salmon that spawn in all sections of the Kenai River drainage. Conservation measures enacted downstream of Slikok Creek are also applicable to more Chinook salmon because most use of the area upstream of Slikok Creek by fish we monitored did not occur until after the fishery closed (July 31) in both years (Figure 20).

[47] Reimer, A., "Migratory Timing and Distribution of Kenai River Chinook Salmon, 2010-2013, a Report to the Alaska Board of Fisheries 2014," 2013. Regional Information Report No. 2A13-06 pg 55 (proportion to abundance)

Exposure and stress. Motoring over and past spawning grounds and concentrated fishing pressure at "fishing holes" causes stress.

Long staging times averaging 33 days (up to 67)[48] [49] in the Kenai River mainstem adds exposure to Kenai River mainstem and tributary-spawning Kings.

Bendock, FMS 92-2 pg 41

The duration of time between tagging and death (stream life) was calculated for 282 fish that were judged to have spawned (Table 16). Mean stream life was 33 days (SE = 0.609) and ranged from 8 to 67 days. Stream life was significantly longer for tributary spawners (mean = 35.1 d, SE = 0.7428) and consequently for early-run fish, than for mainstem spawners (mean = 30.3 d, SE = 0.9846). Fish that spawned in Benjamin Creek had the longest stream life (41.5 d) and mainstem spawners had the shortest (30.5 d).

Reimer RIR No 2A13-06 pg 36:

early bound on the date when spawning could have begun. Chinook salmon with spawning destinations within the Kenai River mainstem began displaying site fidelity to their eventual spawning area as early as late June although in most years and river sections, no site fidelity was displayed until July. The median date for radiotagged Chinook salmon to begin displaying site fidelity to their eventual spawning area varied between 12 and 21 August for all years and river sections. All radiotagged Chinook salmon with a mainstem spawning destination displayed site fidelity to their eventual spawning area by early September. Site fidelity lasted for 6–63 days (median 14 days)[8]. Spawning is assumed to have occurred toward the end of each fish's site

[48] Bendock, T., "Mortality and Movement Behavior of Hooked-and-Released Chinook Salmon in the Kenai River Recreational Fishery, 1989-1991," 1992. Fishery Manuscript No. 92-2, pg 41, 46

[49] Reimer, A., "Migratory Timing and Distribution of Kenai River Chinook Salmon, 2010-2013, A Report to the Alaska Board of Fisheries 2014." RIR No. 2A13-06 pg 36 (site fidelity up to 63 days)

From 2008-2010, the Kenai Watershed recorded at peak more than 700 outboard motor boats running the Kenai River below Skilak Lake simultaneously.[50]

In recent years, the Kenai Watershed Forum (KWF) has documented more than 700 outboard motorboats in simultaneous operation on the lower 50 miles of the river.

[50] Kenai Watershed Forum, "Turbidity Monitoring on the Kenai River, 2008-2010," 2012. http://dec.alaska.gov/water/wnpspc/protection_restoration/KenaiRiverWQ/pdfs/KWF_KENAI_RIVER_TURBIDITY_REPORT.pdf pg 5

EAST SIDE SETNET EFFECT

Early-run. The Kenai-East Forelands section (Kenai River area and north) of East Side Setnetters has not fished the early-run at all in 30 years (1985)[51]. Their season doesn't start until July 8 at the earliest.[52]

pg 267:

> From 1973–1983, all of the Upper Subdistrict set gillnet fishery opened on June 25. In 1984, that area of beach north of Kasilof River opened on July 10, with an earlier opening based on an escapement trigger. From 1985–1996, the Kenai and East Foreland sections (Figure 118-1) opened on or after July 1, with an escapement trigger for an opening as early as June 25. From 1997–2013, the Kenai and East Foreland sections set gillnet fishery has opened on or after July 8.

Eskelin, pg 8:

> ESSN commercial harvests are reported for 7 statistical areas: Ninilchik Beach (244-22), Cohoe Beach (244-22), South K-Beach (244-31), North K-Beach (244-32), Salamatof Beach (244-41), East Forelands (244-42), and Kasilof River special harvest area (KRSHA) (244-25) (Figure 2). The Kasilof Section is composed of Ninilchik Beach, Cohoe Beach, and South K-Beach. The Kenai Section is composed of North K-Beach and Salamatof Beach. The East Forelands statistical area is its own section, but was grouped with the Kenai Section in this study. KRSHA is not commonly opened for fishing but has been opened at times to concentrate harvest of Kasilof River sockeye salmon while minimizing harvest of other stocks. The Kasilof Section opens the first Monday or Thursday on or after 25 June but can open as early as 20 June if ADF&G estimates that 50,000 sockeye salmon are in the Kasilof River before 25 June (Alaska Administrative Code 5 AAC 21.310 b. 2.C.[i]). The Kenai and East Forelands sections do not open until the first Monday or Thursday on or after 8 July.

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[51] ADF&G, "Staff Comments to the Alaska Board of Fisheries," 2014. RIR.2a.2013.04 pg 267 (Kenai-East Forelands Section)

[52] ADF&G, "Staff Comments to the Alaska Board of Fisheries," 2014. RIR.2a.2013.04 pg 267 (Kenai-East Forelands Section)

On years when Kasilof sockeye are running abundantly and early, the Kasilof section of the Eastside Setnet area sometimes will have fishing opportunity during last ten days of June.[53] ADF&G describes their catch of returning early-run Kings as "insignificant."[54]

Eskelin, pg 8:

ESSN commercial harvests are reported for 7 statistical areas: Ninilchik Beach (244-22), Cohoe Beach (244-22), South K-Beach (244-31), North K-Beach (244-32), Salamatof Beach (244-41), East Forelands (244-42), and Kasilof River special harvest area (KRSHA) (244-25) (Figure 2). The Kasilof Section is composed of Ninilchik Beach, Cohoe Beach, and South K-Beach. The Kenai Section is composed of North K-Beach and Salamatof Beach. The East Forelands statistical area is its own section, but was grouped with the Kenai Section in this study. KRSHA is not commonly opened for fishing but has been opened at times to concentrate harvest of Kasilof River sockeye salmon while minimizing harvest of other stocks. The Kasilof Section opens the first Monday or Thursday on or after 25 June but can open as early as 20 June if ADF&G estimates that 50,000 sockeye salmon are in the Kasilof River before 25 June (Alaska Administrative Code 5 AAC 21.310 b. 2.C.[i]). The Kenai and East Forelands sections do not open until the first Monday or Thursday on or after 8 July.

Begich, pg 7-8:

Kenaitze Indian Tribal Association's educational fishery (Table 7). Commercial harvests of

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early-run Chinook salmon are considered insignificant.

[53] Eskelin, T., "Mixed Stock Analysis and Age, Sex, and Length Composition of Chinook Salmon in the Eastside Set Gillnet Fishery in Upper Cook Inlet, Alaska, 2010-2013," 2013. Fishery Data Series No. 13.63 pg 8 (Kasilof opening)

[54] Begich, R., "2010-2012 Annual Management Report and 2013 Recreational Fisheries Overview for Northern Kenai Peninsula: Fisheries under Consideration by the Alaska Board of Fisheries, 2014," 2013. Fishery Management Report No. 13-51, pg 7-8 ("insignificant")

Genetic stock identification of Kenai tributary-bound Kings harvested by all Eastside Setnetters combined averaged .004 over the entire 2010-2013 seasons.[55]

Eskelin, pg 35:

Harvest by Reporting Group

Proportions of harvest by reporting group were similar between years. *Kenai River mainstem* was the predominate reporting group, averaging 0.692 (range: 0.643 to 0.766) of the harvest each year, followed by *Kasilof River mainstem*, averaging 0.290 (range: 0.213 to 0.330) (Table 15). *Cook Inlet other* averaged 0.014 of the harvest (range: 0.002 to 0.020) and *Kenai River tributaries* averaged 0.004 of the harvest (range: 0.001 to 0.011) (Table 15).

[55] Eskelin, T., "Mixed Stock Analysis and Age, Sex, and Length Composition of Chinook Salmon in the Eastside Set Gillnet Fishery in Upper Cook Inlet, Alaska, 2010-2013," 2013. Fishery Data Series No. 13-63 pg 35 (.004 tributary spawners)

Eastside Setnetters objectively are neither the cause or nor a contributing factor to the decline of the early-run King fishery.

On any year, the only significant harvests of the early-run Kenai Kings are by in-river sportfishmen.

This is an obvious conclusion from the preceding statements.

Late-run. In 2013, all of the East Side Setnetters' late-run King harvest contributed .5% (½ percent) to the value of their sockeye salmon fishing harvest.[56]

Shields, pg 6:

CHINOOK SALMON

The 2013 UCI harvest of 5,398 Chinook salmon was the fifth smallest since 1966 and was approximately 63% less than the previous 10-year (2003–2012) average annual harvest of 14,450 fish (Appendices A3, B1, and B6). The exvessel value for UCI Chinook salmon in 2013 was estimated at $210,600 dollars, which represented approximately 0.5% of the total exvessel value for all salmon (Appendix B7).

Appendix B7.–Page 2 of 2

Year	Chinook	%	Sockeye	%	Coho	%	Pink	%	Chum	%	Total
1985	$ 799,318	2.3%	$ 27,497,929	80.0%	$ 3,359,824	9.8%	$ 57,412	0.2%	$ 2,644,995	7.7%	$ 34,359,478
1986	$ 915,189	2.0%	$ 38,683,950	83.3%	$ 2,909,043	6.3%	$ 724,367	1.6%	$ 3,197,973	6.9%	$ 46,430,522
1987	$ 1,609,777	1.6%	$ 95,915,522	94.9%	$ 2,373,254	2.3%	$ 84,439	0.1%	$ 1,116,165	1.1%	$ 101,099,156
1988	$ 1,120,885	0.9%	$ 111,537,736	91.3%	$ 4,738,463	3.9%	$ 650,931	0.5%	$ 4,129,002	3.4%	$ 122,177,017
1989	$ 803,494	1.4%	$ 56,194,753	95.0%	$ 1,674,393	2.8%	$ 86,012	0.1%	$ 415,535	0.7%	$ 59,174,188
1990	$ 436,822	1.1%	$ 35,804,485	88.0%	$ 2,422,214	6.0%	$ 512,591	1.3%	$ 1,495,827	3.7%	$ 40,671,938
1991	$ 348,522	2.3%	$ 12,249,200	80.4%	$ 1,996,049	13.1%	$ 5,478	0.0%	$ 643,400	4.2%	$ 15,242,649
1992	$ 634,466	0.6%	$ 96,026,864	96.0%	$ 2,261,862	2.3%	$ 404,772	0.4%	$ 740,294	0.7%	$ 100,068,258
1993	$ 617,092	2.1%	$ 27,969,409	93.1%	$ 1,081,175	3.6%	$ 36,935	0.1%	$ 322,205	1.1%	$ 30,026,815
1994	$ 642,291	1.9%	$ 29,441,442	85.5%	$ 3,297,865	9.6%	$ 240,545	0.7%	$ 831,121	2.4%	$ 34,453,264
1995	$ 474,475	2.2%	$ 19,168,077	87.1%	$ 1,295,353	5.9%	$ 53,114	0.2%	$ 1,023,926	4.7%	$ 22,014,944
1996	$ 402,980	1.4%	$ 28,238,578	95.0%	$ 800,423	2.7%	$ 44,386	0.1%	$ 225,751	0.8%	$ 29,712,117
1997	$ 365,316	1.1%	$ 31,439,536	97.1%	$ 434,327	1.3%	$ 12,004	0.0%	$ 143,244	0.4%	$ 32,394,427
1998	$ 181,318	2.1%	$ 7,686,993	88.5%	$ 497,050	5.7%	$ 187,759	2.2%	$ 132,025	1.5%	$ 8,685,145
1999	$ 337,482	1.6%	$ 20,095,838	95.5%	$ 329,164	1.6%	$ 5,995	0.0%	$ 265,026	1.3%	$ 21,033,505
2000	$ 183,368	2.2%	$ 7,115,614	87.2%	$ 626,287	7.7%	$ 47,065	0.6%	$ 186,385	2.3%	$ 8,158,719
2001	$ 169,634	2.2%	$ 7,136,593	92.3%	$ 297,328	3.8%	$ 20,317	0.3%	$ 111,093	1.4%	$ 7,734,965
2002	$ 326,051	2.8%	$ 10,682,051	91.7%	$ 329,031	2.8%	$ 84,922	0.7%	$ 224,148	1.9%	$ 11,646,203
2003	$ 358,940	2.8%	$ 12,284,753	95.3%	$ 132,079	1.0%	$ 8,660	0.1%	$ 99,850	0.8%	$ 12,884,282
2004	$ 662,550	3.2%	$ 19,407,784	93.8%	$ 416,196	2.0%	$ 65,861	0.3%	$ 129,795	0.6%	$ 20,682,185
2005	$ 688,908	2.2%	$ 30,159,190	95.2%	$ 708,793	2.2%	$ 12,783	0.0%	$ 101,123	0.3%	$ 31,670,797
2006	$ 617,133	4.4%	$ 12,301,215	88.5%	$ 679,754	4.9%	$ 174,576	1.3%	$ 121,343	0.9%	$ 13,894,021
2007	$ 629,521	2.7%	$ 21,905,667	93.6%	$ 683,110	2.9%	$ 53,074	0.2%	$ 141,156	0.6%	$ 23,412,528
2008	$ 544,120	3.3%	$ 15,525,621	93.0%	$ 482,608	2.9%	$ 64,529	0.4%	$ 75,774	0.5%	$ 16,692,652
2009	$ 266,548	1.8%	$ 13,720,261	94.1%	$ 399,704	2.7%	$ 71,582	0.5%	$ 115,899	0.8%	$ 14,573,994
2010	$ 349,102	1.0%	$ 32,112,265	93.1%	$ 943,909	2.7%	$ 235,990	0.7%	$ 837,590	2.4%	$ 34,478,856
2011	$ 634,617	1.2%	$ 51,359,744	96.7%	$ 406,677	0.8%	$ 27,511	0.1%	$ 688,876	1.3%	$ 53,117,425
2012	$ 121,652	0.4%	$ 31,964,791	92.2%	$ 480,488	1.4%	$ 624,565	1.8%	$ 1,458,716	4.2%	$ 34,650,212
2013	$ 210,638	0.5%	$ 37,787,069	93.9%	$ 1,362,395	3.4%	$ 53,754	0.1%	$ 828,113	2.1%	$ 40,241,970

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[56] Shields, P., "Upper Cook Inlet Commercial Fisheries Annual Management Report, 2013," 2013. Fishery Management Report No. 13-49 pg 6 (Kings = .5% total exvessel value)

Of the total King harvest by Eastside Setnet fishermen, 31.3% were bound for river systems other than the Kenai River according to a four-year genetic stock identification study.[57] [58]

68.7% of the Kings caught by Eastside Setnetters were bound for the Kenai corresponds to 31.3% bound for other river systems.

Fleischman 13-02, pg 5:

Stock composition of fish harvested in the Upper Subdistrict Set Gillnet fishery ("eastside setnet fishery") was estimated by GSI in 2010 and 2011 (Appendix B). Estimates of the proportion of Kenai River fish in the harvest (0.647 in 2010; 0.727 in 2011) were applied to eastside setnet harvests for those years. The 2010–2011 average (0.687) was applied to eastside setnet fishery harvests for the years 1986–2009 and 2012.

Average Kenai River Kings caught by Eastside setnetters = .692(mainstem) + .004(tributaries) = .696 Kenai-bound fraction of ESSN King harvest

Eskelin, pg 35:

Harvest by Reporting Group

Proportions of harvest by reporting group were similar between years. *Kenai River mainstem* was the predominate reporting group, averaging 0.692 (range: 0.643 to 0.766) of the harvest each year, followed by *Kasilof River mainstem*, averaging 0.290 (range: 0.213 to 0.330) (Table 15). *Cook Inlet other* averaged 0.014 of the harvest (range: 0.002 to 0.020) and *Kenai River tributaries* averaged 0.004 of the harvest (range: 0.001 to 0.011) (Table 15).

Table 15.–Proportions of ESSN Chinook salmon harvested by reporting group, 2010, 2011, and 2013.

	2010		2011		2013		
Reporting Group	Proportion	SD	Proportion	SD	Proportion	SD	Average
Kenai River tributaries	0.011	0.010	0.001	0.004	0.001	0.004	0.004
Kenai River mainstem	0.643	0.037	0.667	0.040	0.766	0.023	0.692
Kasilof River mainstem	0.326	0.034	0.330	0.040	0.213	0.022	0.290
Cook Inlet other	0.020	0.014	0.002	0.004	0.019	0.006	0.014

57 Fleischman, S., "Run Reconstruction, Spawner-Recruit Analysis, and Escapement Goal Recommendation for Late-Run Chinook Salmon in the Kenai River," 2013. Fishery Manuscript Series No. 13-02 pg 5 (.687 factor)

58 Eskelin, T., "Mixed Stock Analysis and Age, Sex, and Length Composition of Chinook Salmon in the Eastside Set Gillnet Fishery in Upper Cook Inlet, Alaska, 2010-2013," 2013. Fishery Data Series No. 13-63 pg 35 (Kenai River King fraction)

According to a genetic stock identification study, in 2013, East Side Setnetters' catch of late-run Kings 5 years old and older (large enough to be counted by the Didson counter inriver[59]) was 3.5% of the total run.[60] 5 year-olds and 6 year-olds are of average size (30"); large enough to be counted by the Didson counter. The Hammarstrom study maps those age-length correlations for late-run Kenai Kings.

Eskelin, pg 34: .687 (kenai-bound [57 58]) x (455 (1.3 = 5yr-olds) + 557 (1.4 = 6 yr-olds)) / 19,711 (total run size [1]) = .0352 = 3.5% :

Table 14.–Age, sex, and length composition of Chinook salmon harvested in the Eastside set gillnet Chinook Salmon fishery, Upper Cook Inlet, Alaska, 2013.

		Age Class				
Sex	Parameter	1.1	1.2	1.3	1.4	All ages
Females						
	Harvest by age			146	227	373
	SE (harvest by age)			24	29	35
	Samples by age			29	44	73
	Age composition			4.9%	7.6%	12.5%
	SE (age composition)			0.8%	1.0%	1.2%
	Mean length (mm)			839	959	911
	SE (mean length)			10	17	9
Males						
	Harvest by age	678	1,298	309	331	2,615
	SE (harvest by age)	42	51	33	34	35
	Samples by age	167	286	66	72	591
	Age composition	22.7%	43.4%	10.3%	11.1%	87.5%
	SE (age composition)	1.4%	1.7%	1.1%	1.1%	1.2%
	Mean length (mm)	414	589	867	1012	622
	SE (mean length)	3	3	9	8	8
Both Sexes						
	Harvest by age	678	1,298	455	557	2,988
	SE (harvest by age)	42	51	38	42	
	Samples by age	167	286	95	116	664
	Age composition	22.7%	43.4%	15.2%	18.6%	100.0%
	SE (age composition)	1.4%	1.7%	1.3%	1.4%	
	Mean length (mm)	451	589	832	986	658
	SE (mean length)	3	3	7	6	8

Note: Values given by age and sex may not sum to totals due to rounding.

Continued on next page…

[59] Hammerstrom, S., "Annual Performance Report for Kenai Peninsula Chinook and Coho Salmon," 1984. Fredf-10-1(27)S32-1,2,4,5 pg 72 (table 13, age/weight/length data from 1985) Mean length of 4 yr-olds was 26.4 inches. Mean length of 5 year-olds was 33.9 inches.

[60] Eskelin, T., "Mixed Stock Analysis and Age, Sex, and Length Composition in the Eastside Set Gillnet Fishery in Upper Cook Inlet, Alaska, 2010-2013," 2013. Fishery Data Series No. 13-63 pg 34 (age sex composition 2013)

Mean length in the Hammarstrom table 13 below are translated to inches in the following table. Didson counter counts fish 30" and greater in length. This study allows mapping length to age.

Table 13. Summarized Age/Weight/Length Data from Readable Scales Collected from Chinook Salmon Taken in the Recreational Fishery on the Kenai River, 1985.

Age Class / Brood Year		1.2 / 1981	1.3 / 1980	1.4 / 1979	1.5 / 1978	Other	Total
Early Run							
Number		18	39	225	12	0	294
Percent		6.1	13.3	76.5	4.1	0.0	100.0
Length (mm)*			660-990	790-1,190	950-1,210		
	Range	435-700	715-970	670-1,170	840-1,340		435-1,340
	Mean	619	851	981	1,093		946
	S.D.	64.3	64.0	80.2	152.5		
Weight (kg)							
	Range	2.7-7.3	6.2-16.5	14.7-30.0	12.7-35.8		2.7-35.8
	Mean	4.9	11.7	17.5	23.1		16.2
	S.D.	1.4	2.6	4.7	9.4		
Late Run							
Number		18	59	339	37	8	1
Percent		3.9	12.8	73.5	8.0	1.7	100.0
Length (mm)*							
	Range	530-770	680-1,050	830-1,260	850-1,320	380-1,230	380-1320
	Mean	659	885	1040	1087	776	1004
	S.D.	56.0	78.5	79.1	100.0	366.5	
Weight (kg)							
	Range	2.3-8.2	7.0-19.1	7.8-34.1	11.8-36.4	0.8-26.8	0.8-36.4
	Mean	5.6	13.3	20.7	24.4	15.1	19.4
	S.D.	1.7	3.0	4.9	6.8	14.8	

* Lengths are mid-eye to fork of tail.
S.D. - Standard Deviation

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From Hammarstrom table 13, mean length of 4 yr-olds was 26.4 inches and 5 yr-olds was 33.9 inches.

1984 Age-Length Correlation in Kings (Mid-eye to tail-fork lengths)	
EARLY RUN: 420 mm = 16.5" 4 yr-old (1:2) 690 mm = 27" 4 yr-old (1:2) Mean Length = 22" Mean Weight = 7.7lbs	**LATE RUN:** 560 mm = 22" 4 yr-old (1:2) 780 mm = 31" 4 yr-old (1:2) Mean Length = 26.4" Mean Weight = 13lbs
660 mm = 26" 5 yr-old (1:3) 990 mm = 39" 5 yr-old (1:3) Mean Length = 31.3" Mean Weight = 21.2lbs	670 mm = 26" 5 yr-old (1:3) 1,010 mm = 40" 5 yr-old (1:3) Mean Length = 33.9" Mean Weight = 27.3lbs
790 mm = 31" 6 yr-old (1:4) 1,190 mm = 47" 6 yr-old (1:4) Mean Length = 39.1" Mean Weight = 40.1lbs	810 mm = 32" 6 yr-old (1:4) 1,220 mm = 48" 6 yr-old (1:4) Mean Length = 41.7" Mean Weight = 48.7"
950 mm = 37" 7 yr-old (1:5) 1,210 mm = 47.6" 7 yr-old (1:5) Mean Length = 42.2" Mean Weight = 48.7lbs	970 mm = 38" 7 yr-old (1:5) 1,295 mm = 51" 7 yr-old (1:5) Mean Length = 44.4" Mean Weight = 56.7lbs

Total run size = 19,711 [1]:
From:Begich, R. "2010-2012 Annual Management Report and Recreational Fisheries Overview...," 2014. Fishery Management Report No. 13-51, pg 100 (run strengths)

Table 8.–Late-run Kenai River Chinook salmon population data, 1986–2013.

Year	Deep Creek Marine Harvest[a]	Eastside Setnet Harvest[b]	Drift Gillnet Harvest[b]	Comm & PU[c]	Kenaitze Educational	Sub[d]	PU Dipnet[e]	Sport Harvest Below Sonar[f,g]	Innver Run Estimated by Sonar[h]	Sport Harvest Above Sonar[f,g]	Catch-and-Release Mortality[i]	Spawning Escapement	Total Run	Harvest Rate
1986	378	13,619	1,100	ND	ND	ND	ND	ND	62,740	9,872	316	52,552	77,837	0.325
1987	731	14,536	2,731	ND	ND	ND	235	ND	63,550	13,100	123	50,327	81,783	0.385
1988	892	8,834	1,330	ND	ND	ND	0	ND	61,760	19,695	176	41,889	72,816	0.425
1989	821	7,498	0	ND	ND	22	0	ND	36,370	9,691	88	26,591	44,711	0.405
1990	963	2,843	373	91	ND	13	ND	ND	34,200	6,897	69	27,234	38,483	0.292
1991	1,023	3,361	145	130	ND	288	ND	ND	38,940	7,903	16	31,021	43,887	0.293
1992	1,269	7,363	326	50	ND	402	0	ND	42,290	7,556	234	34,500	51,700	0.333
1993	1,700	9,672	451	81	ND	27	0	ND	50,210	17,775	478	31,957	62,142	0.486
1994	1,121	10,700	276	9	1	392	ND	ND	47,440	17,837	572	29,031	59,939	0.516
1995	1,241	8,291	314	25	3	ND	712	ND	44,770	12,609	472	31,689	55,355	0.428
1996	1,223	7,944	219	31	1	ND	295	ND	42,790	8,112	337	34,341	52,503	0.346
1997	1,759	7,780	293	30	20	ND	364	ND	41,120	12,755	570	27,795	51,367	0.459
1998	1,070	3,495	199	35	2	ND	254	ND	47,110	7,515	595	39,000	52,165	0.252
1999	602	6,501	345	59	4	ND	488	1,170	43,670	12,425	682	30,563	52,839	0.422
2000	631	2,531	162	27	6	ND	410	831	47,440	14,391	499	32,550	52,038	0.374
2001	552	4,128	371	80	8	ND	638	1,336	53,610	15,144	825	37,641	60,724	0.380
2002	256	6,511	249	15	6	ND	606	1,929	56,800	10,678	665	45,457	66,372	0.315
2003	120	10,174	744	53	11	ND	1,016	823	85,110	16,120	1,803	67,187	98,052	0.315
2004	996	14,897	916	218	10	ND	792	2,386	79,690	14,988	1,019	63,683	99,905	0.363
2005	624	15,183	1,103	639	11	ND	997	2,287	77,440	15,927	1,267	60,246	98,284	0.387
2006	563	6,840	631	61	11	ND	1,034	3,322	62,270	12,490	830	48,950	74,732	0.345
2007	478	8,445	547	38	6	0	1,509	1,750	47,370	9,690	670	37,010	60,143	0.385
2008	310	5,203	392	23	15	0	1,362	1,011	42,840	10,128	370	32,342	51,156	0.368
2009	154	3,839	515	64	4	0	1,189	1,132	29,940	7,904	626	21,410	36,837	0.419
2010	335	4,567	323	32	21	0	865	445	23,250	6,762	264	16,224	29,839	0.456
2011	528	5,596	356	88	5	0	1,243	458	27,090	6,894	479	19,717	35,363	0.442
2012	30	484	115	41	0	0	40	2	27,910	101	95	27,714	28,622	0.032
2013[j]	not avail	2,256	267	117	8	0	11	37	17,015	1,541	79	15,395	19,711	0.219
Avg (1986-2002)	955	7,389	523	51	6	191	308	1,317	47,930	11,997	395	35,538	57,451	0.379
Avg (2003-2013)	414	7,044	537	125	9	0	914	1,241	47,266	9,322	682	37,262	57,513	0.339
Avg (1986-2013)	754	7,253	528	85	8	88	586	1,261	47,669	10,946	508	36,215	57,475	0.363

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