Section 2

ADULT ANADROMOUS FISH USE IN THE SUSITNA RIVER

An annotated bibliography

Compiled for the
Region II FRPA Riparian Management Science & Technical Committee

by
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SUMMARY

These documents provide detailed information on adult salmon and other anadromous species from 1974 through 1985. This is likely the most comprehensive look at adult salmon life histories, physical characteristics, and spawning habitat for any Cook Inlet drainage, and probably more information than we have for most drainages within the State. The most important information relative to the development of timber harvest standards is the importance of sloughs and side channels of the Susitna and, by inference, other glacial rivers. In addition to juvenile overwintering and rearing, side channels and sloughs of the Susitna River provide a large portion of the total spawning habitat for middle reach chum and sockeye salmon. Coho salmon also spawn within these habitats. As such any land use practice that could affect the development these off-channel habitats should be conducted to avoid or minimize any potential modification to the development or physical characteristics of these systems. The development and maintenance of water flow during incubation due to changes in mainstem flow, upwelling, and ice formation appeared to be the major factors influencing the survival and development of salmon eggs.

REFERENCES

Adult anadromous fisheries Project. 1982. Stock separation feasibility report. Susitna Hydro Aquatic Studies, Phase 1 final draft report. Subtask 7.10. Alaska Department of Fish and Game, Anchorage, Alaska. APA Document # 403.

Scale pattern analyses were used to determine stock contribution of major river systems to the Cook Inlet commercial fishery. Estimates for the 1979 and 1980 fishery show sockeye stock contribution by the Susitna River of 22.7 and 19.2%, respectively. Stock separation for chum was not possible because west-side production was unknown although the Susitna is known to be

a major contributor. The Susitna River is estimated to be the major source of coho salmon and in combination with the Kenai River, a major source of pink salmon.

Barrett, B.M. 1974. An assessment of the anadromous fish populations in the upper Susitna River watershed between Devil Canyon and the Chulitna River. Alaska Department of Fish and Game, Anchorage, Alaska. APA document #1612.

Salmon were captured in fish wheels placed within the Susitna River upstream of Talkeetna. Fish wheel captures were used to determine run timing, age-length-sex composition and relative abundance. Chum and pink salmon dominated the captures. Pink salmon migration occurred during the last week of July and the first week of August. Chum salmon migration was in the second and third weeks of Augusts. Chum were primarily 3 and 4 year old fish. Coho were observed from mid August to mid September. Coho were predominately 4-year old fish. Cum salmon spawning, sockeye spawning, and coho rearing was documented in sloughs. Pink and chum salmon spawned in clear water tributaries.

Barrett, B.M. 1975. December investigations on the upper Susitna River watershed between Devil Canyon and Chulitna River. Alaska Department of Fish and Game, Anchorage, Alaska. APA Document #548.

Coho salmon fry were captured within the mainstem Susitna during the winter suggesting overwintering. Coho juveniles were also captured in a number of side channels or sloughs. Susitna River suspended solids during the winter ranged from 18 to 228 ppm at Chase and on January 22, 1975 measured 4 ppm at the Anchorage-Fairbanks [Park' Highway] crossing.

Barrett, B.M., F.M. Thompson, and S.M. Wick. 1984. Adult anadromous fish investigations: May-October 1983. Susitna Hydro Aquatic Studies, Report No. 1. Alaska Department of Fish and Game, Anchorage, Alaska, APA Document 1450.

Adult salmon escapement, age, length and spawning locations are documented for data from the 1983 sampling year. This document also contains information on Eulachon and Bering Cisco. Summaries are provided for each species, as are appendices with tables of field data.

Barrett, B.M., F.M. Thompson, and S.N. Wicks. 1985. Adult salmon investigations: May-October 1984. Susitna Aquatic Studies Program. Report No. 6. Alaska Department of Fish and Game, Anchorage, Alaska. APA Document #2748.

This document summarizes the escapement run timing and stock characteristics of chinook, sockeye, pink, chum and coho salmon in the mainstem Susitna, Yentna, and upstream of the Talkeetna and spawning locations and habitats for these species based on 1984 data. In 1984 salmon escapement was estimated at 5.4 millon fish, of these 2% were chinook, 11% sockeye, 68% pink, 15% chum, and 4% coho. Chinook salmon were predominately 5 and 6-year old fish

that spent 2 years rearing in fresh water. Migration at Talkeetna occurred from mid June to Mid July. Chinook spawned in most clear-water tributaries to the Susitna River. Most spawning occurred in Portage Creek (76%) followed by Indian River (20%). Sockeye salmon entered the river in two runs. Most fish were 4, 5, or 6 years old and reared for 2 years in fresh water. Within the middle reach of the Susitna (above Talkeetna) the early run spawned in the Fish Creek/Papa Bear Lake system and the second run spawned in mainstem sloughs. Pink salmon spawned in the lower reach tributaries primarily Willow, Birch, and Sunshine Creek from July 28 to September 25 with the peak during the first two weeks of August. Pink salmon spawned in middle river sloughs and Clearwater tributaries primarily Indian River, Portage Creek and 4th of July Creek. Chum salmon spawned in lower reach side channels and sloughs and stream mouths in September and early October. Within the middle reach chum salmon spawned in main channel, tributaries, sloughs and side channels from August through September. Coho salmon spawned in mainstem, slough, and tributary habitats. Within the middle river, Indian, Whiskers, and Chase Creek were the major coho salmon spawning streams. Spawning occurred from the third week of September through the second week of October.

Bigler, J., K. Levesque. 1985. Lower Susitna River preliminary chum salmon spawning habitat assessment. Susitna Aquatic Studies Program. Draft technical memorandum. Alaska Department of Fish and Game. Anchorage, Alaska. APA Document #3504.

Chum salmon spawning habitat and egg survival was evaluated at a number of side channel spawning locations near Trapper Creek. Subsurface and surface water temperatures were measured through the winter. Subsurface water temperatures were generally warmer and more stable than surface water temperatures. Water surface elevations were more stable in side channels relative to the main-stem during the winter. Upwelling water was observed at all sites. Spawning substrates were composed of large gravel or cobble on the surface and gravel and sand below 4 inches. Egg survival was good except at one location where there was a lack of upwelling and eggs froze before mainstem surface ice developed. Spring outmigration sampling confirmed chum salmon survival and documented the use of the same habitats for chinook, coho and sockeye juvenile overwintering.

Hoffmann, A.G. 1985. Summary of salmon fishery data for selected middle Sustina River sites (1981-1984). Susitna Aquatic Studies Program. Report No. 9 Alaska Department of Fish and Game, Anchorage, Alaska. APA Document 2749.

This document is a summary of the fishery data collected at all sampling locations. The sampling locations, adult and juvenile observations and use as well as some physical characteristics are identified.

Quane, T., I. Queral, T. Keklak, and D. Seagren. 1984. Channel geometry investigations of the Susitna River basin. Chapter 2 in: C.C. Estes, and D.S. Vincent-Lang, editors. Aquatic habitat and instream flow investigations, May-October 1983. Susitna Hydro Aquatic Studies. Report No. 3 (Volume 2). Alaska Department of Fish and Game, Anchorage, Alaska. APA Document #1931.

Channel geometry data were collected since 1982 at twent-one side channel, upland and side slough and tributary habitats located in the Talkeeetna to Devil Canyon reach of the Susitna River. These data have been used to describe the channel characteristics of these study sites. Thalweg profiles, depicting the overall gradient, extent of backwater, and substrate composition of the site, were constructed from the data for four side channel and thirteen upland and side sloughs. Cross section profiles, illustrating the cross sectional channel characteristics and wetted surface area as a response to stage changes, were also developed for selected stage/discharge monitoring stations within these study sites.

Sandone, G., D.S. Vincent –Lang, and A. Hoffmann. 1984. Evaluation of chum salmon spawning habitat in selected tributary mouth habitats on the middle Susitna River. Chapter 8 in: C.C. Estes, and D.S. Vincent-Lang, editors. Aquatic habitat and instream flow investigations, May-October 1983. Susitna Hydro Aquatic Studies. Report No. 3 (Volume 8). Alaska Department of Fish and Game, Anchorage, Alaska. APA Document #1936.

This study looked at the change in chum salmon spawning habitat based upon depth and velocity at the mouths of Forth of July Creek and Lane Creek. The amount of habitat changed with the mainstem flow. There was greater spawning area at Forth of July Creek because the confluence with the Susitna was in a side channel and not the mainstem. Chum salmon were spawning in areas where groundwater was upwelling. Many of the spawning redds were dewatered when the Susitna discharge decreased in the Fall and Winter. It is hypothesized that the upwelling water kept the eggs from freezing.

Sautner, J., L.J. Vining, and L.A. Rundquist. 1984. An evaluation of passage conditions for adult salmon in sloughs and side channels of the middle Susitna River. Chapter 6 in: C.C. Estes, and D.S. Vincent-Lang, editors. Aquatic habitat and instream flow investigations, May-October 1983. Susitna Hydro Aquatic Studies. Report No. 3 (Volume 5). Alaska Department of Fish and Game, Anchorage, Alaska. APA Document #1935.

An evaluation of passage conditions for adult salmon into and within twelve slough and side channel sites in the middle reach of the Susitna River is presented to determine the effects of mainstem discharge on passage conditions into these habitat types. These habitats were selected for evaluation as they are affected by mainstem discharges. The sites were selected as they account for the majority of chum, sockeye and pink salmon spawning habitat within the side channels and sloughs within this reach. Salmon passage conditions at each site included the effects of mainstem breaching discharge and backwater staging, and slough flows derived from local water sources (e.g. upwelling, tributaries, precipitation). Timing and distribution of salmon

were evaluated relative to passage conditions and mainstem flow. Local flows were relatively more important in providing successful passage conditions within sloughs and breaching flows in side channels. The effect of mainstem discharges on sources of local flow such as upwelling during unbreached conditions needs to be further evaluated.

Synopsis of the 1982 aquatic studies and analysis of fish and habitat relationships (Section 1 of 2). Susitna Hydro Aquatic Studies. Phase 2 report. Alaska Department of Fish and Game. Anchorage, Alaska. APA Document #40.

This document summarizes the fish and habitat data for the 1981 and 1982 years for resident and adult and juvenile anadromous species. Summaries are provided that describe spawning timing and preferred habitat with more emphasis on published data. More detail is provided on spawning and rearing habitat characteristics than in subsequent studies.

Thompson, F.M., S.N. Wick, and B.L. Stratton. 1986. Adult salmon investigations: May-October 1985. Susitna Aquatic Studies Program. Report No. 13 (Part 1 of 2). Alaska Department of Fish and Game, Anchorage, Alaska. APA Document #3412.

This document describes the results of the 1985 adult salmon escapement studies. Relative escapement estimates, age, weight, sex, and fecundity data as well as spawning locations for chinook, sockeye, chum, pink, and coho salmon are described.

Vincent-Lang, D.S., and I Queral. 1984. Eulachon spawning in the lower Susitna River. Chapter 6 In: C.C. Estes, and D.S. Vincent-Lang, editors. Aquatic habitat and instream flow investigations, May-October 1983. Susitna Hydro Aquatic Studies Report No. 3 (Volume5). Alaska Department of Fish and Game, Achorage, Alaska. APA Document #1934.

Eulachon (Thaleichthys pacificus) were sampled at spawning locations within the lower Susitna River to determine spawning habitat selection in terms of velocity, water depth, and substrate. Spawning timing was evaluated relative to water temperature and discharge. In 1982 and 1983 the earliest catches of eulachon occurred on May 16 and May 11, respectively. There are two runs with more fish in the second run. The first run in 1982 was from May 15 to May 30 and the second from June 1 to June 8. In 1983 the runs occurred approximately 1 week earlier. Spawning fish were observed up to river mile 50.3 in the east channel. There was no correlation with between run timing and temperature. Eulachon spawned along the river margins where velocities were greater than 0.3 ft/s. Eulachon were not observed in clear-water tributaries, sloughs or other slow water habitats. Spawning occurred over a number of different substrates but was most common on bar or riffle habitats along the margins.

Vincent-Lang, D.S., A. Hoffmann, A.E. Bingham, and C.C. Estes. 1984. Habitat suitability criteria for chinook, coho, and pink salmon spawning in tributaries of the middle Susitna River. Chapter 9 in: C.C. Estes, and D.S. Vincent-Lang, editors. Aquatic habitat and instream flow investigations, May-October 1983. Susitna Hydro Aquatic Studies. Report No. 3 (Volume 9). Alaska Department of Fish and Game, Anchorage, Alaska. APA Document #1938.

Use data for the habitat variables of depth, velocity, and substrate composition were collected at chinook salmon spawning sites in selected tributaries for the middle reach of the Susitna River. Chinook spawned at depths from 0.5 to 4,0 ft, velocities from 0.3 to 4.5 ft/sec; and, substrates from small gravels to cobbles. Pink salmon spawned at depts. From 0.3 to 4.0 ft, velocities from 0.1 to 5.0 ft/sec, and substrates fro sand intermixed with gravels to large cobble. Coho salmon spawned at depths from 0.3 to 4.0 ft, velocities from 0.1 to 4.0 ft/sec and substrates fro sand intermixed with gravel to large cobble. Some of the main spawning tributaries for these species are identified.

Vincent-Lang, D.S., A.G. Hoffmann, A.E. Bingham, C.C. Estes, D. Hillard, C. Steward, E.W. Trihey, and S.C. Crumley. 1984. An evaluation of chum and sockeye salmon spawning habitat in sloughs and side channels of the middle Susitna River. Chapter 7 in: C.C. Estes, and D.S. Vincent-Lang, editors. Aquatic habitat and instream flow investigations, May-October 1983. Susitna Hydro Aquatic Studies. Report No. 3 (Volume 7). Alaska Department of Fish and Game, Anchorage, Alaska. APA Document #1936.

Three sloughs and four side channels in the middle reach of the Susitna River were modeled to evaluate the effect that changing mainstem flows would have on chum and sockeye salmon spawning habitat. Depth, velocity, substrate and upwelling were used as parameters in the model. Flows at study sites which supported chum and sockeye salmon spawning were only infrequently affected by mainstem discharge. Wetted usable area at study sites remains relatively slow and stable during the period of peak spawning except during flood events.

Vining, L.J., J.S. Blakely, and G.M. Freeman. 1985. An evaluation of the incubation life-phase of chum salmon in the middle Susitna River, Alaska. Volume 1 in: C.C. Estes, J. Sauntner, and D.S. Vincent-Lang, editors. Winter aquatic investigations (September 1983-May 1984). Susitna Aquatic Studies Program. Report No. 5. Alaska Department of Fish and Game, Anchorage, Alaska. APA Document #2658.

The survival of embryos placed within artificial redds was evaluated at side channel, slough, and mainstem habitats. Survival in sloughs, side channel, and tributary habitats was 17, 9, and 11% respectively. The largest cause of embryo mortality was due to dewatering and subsequent freezing of the streambed. Upwelling water was the most important factor affecting the survival of developing eggs.