APPENDIX J

Age-Length Relationships for Arctic Grayling and Rainbow Trout

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INTRODUCTION

Age-length curves and regressions were examined for Arctic grayling to determine if the growth of the population in the proposed impoundment area above Devil Canyon was significantly different from that of the population below Devil Canyon. Preliminary analysis of 1981 data had indicated that such a difference might exist which, if true, would have relevance to proposed mitigation strategies for Arctic grayling in the impoundment area.

Age-length curves for rainbow trout were also analyzed. The Susitna River basin is near the northern limit of the zoogeographical range for rainbow trout and it was hypothesized that growth rates of the Susitna population may be low, compared to that of other populations. If growth rates are low, the Susitna population may be limited in its ability to absorb impacts associated with the proposed hydroelectric project.

METHODS

Scales taken from rainbow trout and Arctic grayling captured and measured during 1981 and 1982 were aged. Logarithmic ($Y = a + b \ln(X)$) and linear ($Y = a + bX$) regressions of age versus length were then calculated for both species. Arctic grayling were divided into three groups by sampling reach: Cook Inlet to Chulitna River confluence, Chulitna River confluence to Devil Canyon, and Devil Canyon to Oshetna River confluence. Since there are no rainbow trout in the impoundment area except for a transplanted population in the High Lakes, rainbow

trout were divided into two groups, above and below the Chulitna River confluence. Data from 1981 and 1982 were analyzed. Each year's data was analyzed by reach separately for comparative purposes and as a check on sampling and aging procedures. Selected slopes of different regressions were tested for equality (Dixon and Massey 1969).

Large catches of rainbow trout and Arctic grayling were most often made in May, June, or September and to compare rainbow trout captured in May with other rainbow trout captured in September only by year class would give biased results since most growth occurs during a short period in the summer. Therefore, data were entered by month for each age class of fish. For example, an age 1+ grayling was entered as 1.0 years of age if caught in May and 1.2, 1.4, 1.6, and 1.8 years of age if caught in June, July, August, and September respectively.

RESULTS AND DISCUSSION

Arctic Grayling

Log regressions of Arctic grayling age versus length generally fit the data as well or better than linear regressions (Appendix Table J-1). Although slopes and intercepts varied somewhat by reach and year, all the log regressions are very similar and differences are probably due to chance. Growth rates of Arctic grayling in the impoundment and below the Chulitna River confluence are nearly identical. Comparison of slopes (growth) of the log regressions of Arctic grayling captured in 1982 in the impoundment with those captured between the Chulitna River

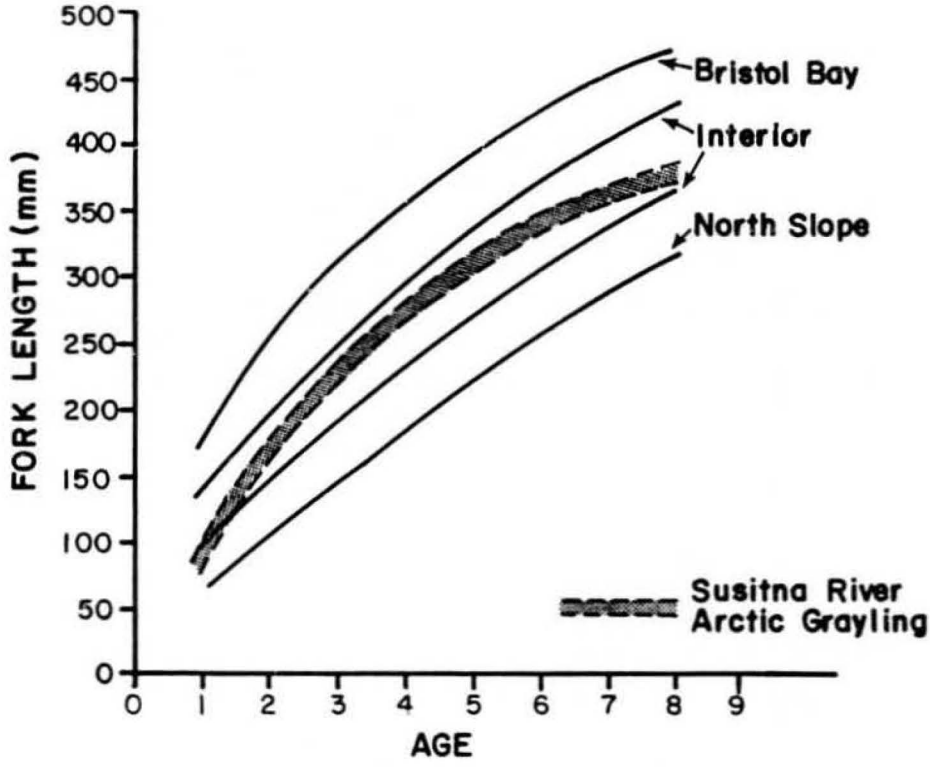
Appendix Table J-1. Results of regression analyses between length and age for Arctic grayling and rainbow trout captured on the Susitna River, 1981 and 1982.

	Area	Slope	Y Intercept	n	r^2	Std Error
Arctic Grayling						
Log	Impoundment, 1982	141.0	84.0	282	.90	14.9
	Above Chulitna, 1982	160.8	23.9	398	.83	27.4
	Below Chulitna, 1982	139.8	74.9	62	.88	24.8
	Impoundment, 1981	155.2	42.6	382	.82	18.4
	Above Chulitna, 1981	117.0	47.6	65	.93	19.0
	Below Chulitna, 1981	152.9	62.6	209	.87	23.5
Linear						
	Impoundment, 1982	29.6	144.5	282	.85	18.3
	Above Chulitna, 1982	45.6	54.6	398	.86	24.8
	Below Chulitna, 1982	47.7	68.3	62	.88	25.2
	Impoundment, 1981	33.2	119.5	382	.81	18.9
	Above Chulitna, 1981	44.8	71.1	65	.91	21.2
	Below Chulitna, 1981	38.2	101.5	209	.87	23.6
Rainbow Trout						
Log	Above Chulitna, 1982	271.3	-104.5	132	.84	34.5
	Below Chulitna, 1982	167.5	50.7	35	.76	--
Linear	Above Chulitna, 1982	57.0	36.4	132	.86	32.2
	Below Chulitna, 1982	42.0	103.0	35	.82	39.8
	Above Chulitna, 1981	50.5	73.6	92	.66	39.4
	Below Chulitna, 1981	62.4	43.5	92	.81	37.6

and Devil Canyon revealed a statistically significant difference ($t=3.71$, $df=676$, $p<.01$), but this difference is probably not biologically important as 1981 data suggest the opposite trend. The growth rates of Arctic grayling in the Susitna River basin are very similar to those of other interior Alaskan populations (Appendix Figure J-1).

Rainbow Trout

Available rainbow trout length-age data from the Susitna River basin fit linear regressions as well or better than log regressions (Appendix Table J-1). Growth rates (slope of age/length regression) of rainbow trout captured above the Chulitna River confluence were not significantly different in 1981 than in 1982 ($t = 1.10$, $df = 220$). These data were pooled and a regression line computed for comparison with other rainbow trout populations (Appendix Figure J-2). The Susitna River rainbow trout were the smallest for any given age class of the populations examined. However, the slope (growth rate) was comparable with the other populations except that of Kootenay Lake.



Appendix Figure J-1. Comparisons of age-length relationship of Arctic grayling in the Susitna River with growth rates of Arctic grayling in other regions of Alaska. Figure is adapted from Armstrong (1982).

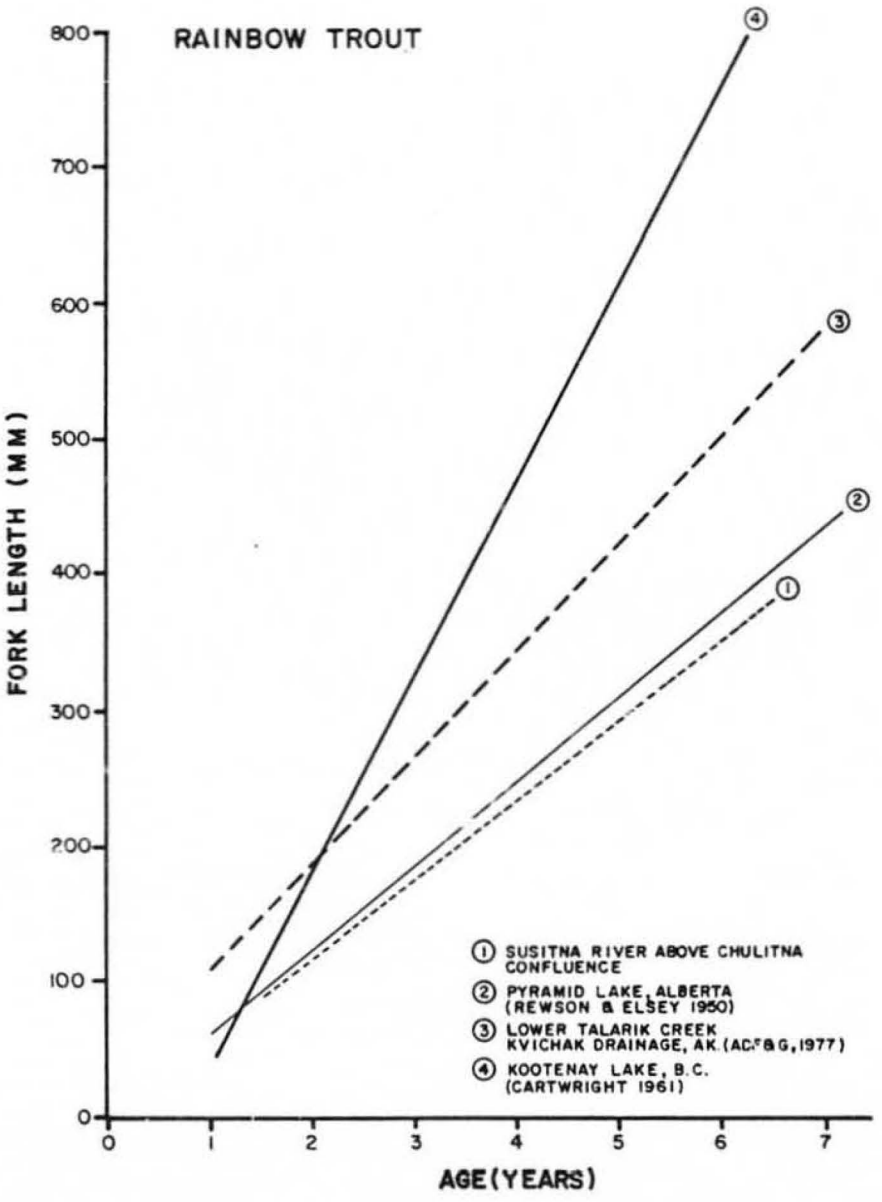


Figure J-2. Comparisons of age-length relationship of rainbow trout in the Susitna River above the Chulitna confluence with other systems. Figure is adapted from TES (1981).

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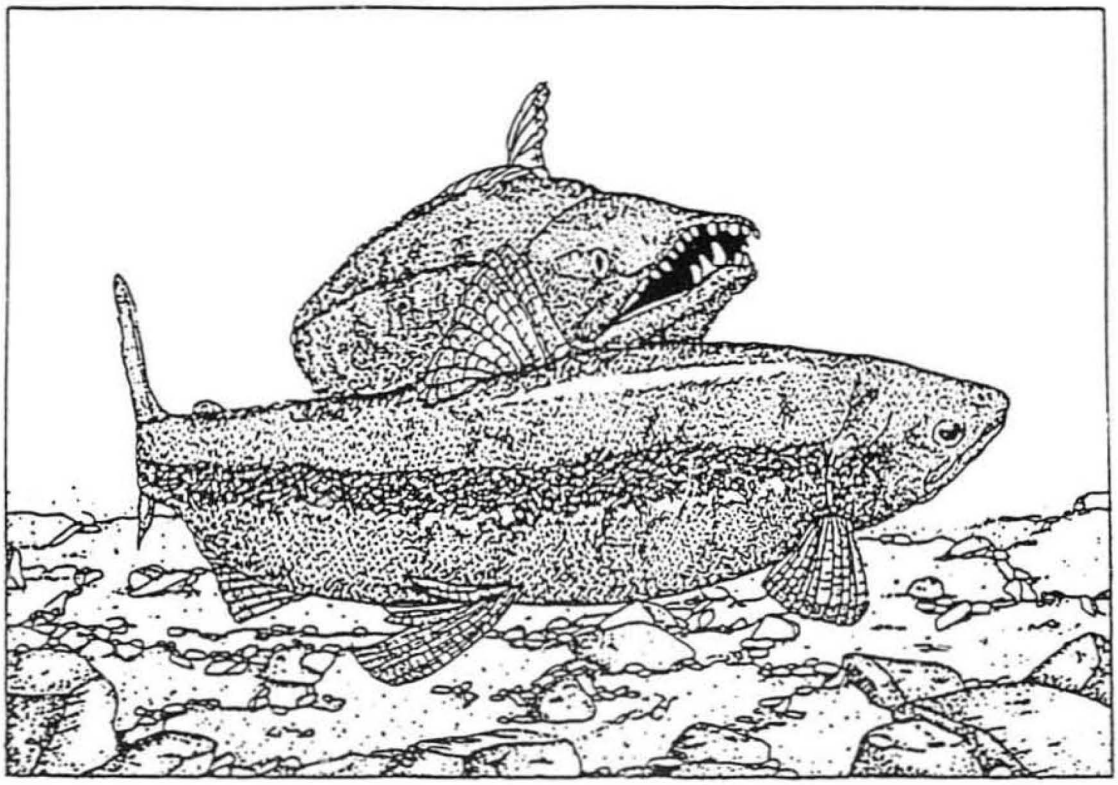

SUSITNA HYDRO AQUATIC STUDIES
PHASE II REPORT

Synopsis of the 1982
Aquatic Studies and Analysis of
Fish and Habitat Relationships

— APPENDICES —

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