

This document is copyrighted material.

Alaska Resources Library and Information Services (ARLIS) is providing this excerpt in an attempt to identify and post all documents from the Susitna Hydroelectric Project.

This article is identified as number **APA 2151** in the *Susitna Hydroelectric Project Document Index* (1988) compiled by the Alaska Power Authority (APA).

We are unable to post it online in its entirety. The first page is displayed here to identify the published work.

The article is available in the ARLIS Susitna collection at call number TK1425.S8A23 no. 2151

Migratory Behavior of Sockeye Salmon Fry and Smolts¹

BY W. L. HARTMAN, W. R. HEARD, AND B. DRUCKER

Bureau of Commercial Fisheries Biological Laboratory, Auke Bay, Alaska

ABSTRACT

Considerable new data on the characteristics of sockeye fry and smolt migrations, direct underwater observations of migrating smolts, and a review of the literature are presented here with a synthesis, evaluation, and interpretation of possible survival advantages of these phenomena. Most fry migrations from spawning areas to nursery lakes take place in the spring, when harsh winter conditions in lakes are moderating and the growing season is beginning. Smolt migrations to salt water closely follow spring breakup of the ice and warming of the lake water. The time of smolt migration is correlated closely with latitude: migration is earlier in southern streams than in northern streams. The duration of seasonal migration appears to be strongly related to travel distance to the trunk river outlet. The smolt exodus is rapid and regular in single-lake systems but irregular and extended in multilake or multibasin systems. The frequency distribution of smolts migrating from two-lake or two-basin systems is usually bimodal. Most migrations commence as water temperatures near 40 F and are over when temperatures approach 50 F. Migrations of smolts and especially fry are mainly confined to the darkest hours of the night. In general, in any one season, the oldest and the largest smolts in each age-group migrate first. Other factors, such as the thickness of the ice, effectiveness of solar radiation in melting ice and warming water, and daily weather (including sunlight and wind), also influence seasonal and diel migration patterns. Underwater observations of smolts at night during migration show that they are schooled, travel in the upper water levels in shallow rivers and deeper (but not near the bottom) in deeper rivers, and usually face downstream and swim as they migrate. During migrations, fry and smolts are both often subjected to a depensatory mortality from intense predation by birds and fish. A factor disproportionately affecting different smolt populations is the length and number of restricted passages along the route to the ocean. Smolts migrating in multilake systems must encounter heavier predation than smolts migrating from single-lake systems. Predation is probably minimized en route because of innate migratory behavior patterns. Exceptions to the general migratory behavior of fry and smolts are described to show the wide range in behavioral response to variable environmental situations.

¹Received for publication June 15, 1967.

JOURNAL OF THE FISHERIES RESEARCH BOARD OF CANADA

Volume 24, No. 10

CONTENTS	PAGES
<p>s D. Homing and orientation of cutthroat trout (<i>Salmo clarki</i>) e Lake, with special reference to olfaction and vision</p> <p>W. Primary productivity in the Babine Lake system, British</p> <p>D G. L. STEWART. Micro-zooplankton in the euphotic zone at across the California Current</p> <p>W. R. HEARD, AND B. DRUCKER. Migratory behavior of sockeye d smolts</p> <p>Unusual fishes taken by midwater trawl off the Queen Charlotte islands, British Columbia</p> <p>COBLE, DANIEL W. The white sucker population of South Bay, Lake Huron, and effects of the sea lamprey on it</p> <p>WERNER, A. E., AND W. F. HYSLOP. Distributions of kraft mill effluent in a British Columbia harbour</p> <p>AHMED, MUZAMMIL, AND ALBERT K. SPARKS. A preliminary study of chromosomes of two species of oysters (<i>Ostrea lurida</i> and <i>Crassostrea gigas</i>)</p> <p>ARAI, HISAO P. Ecological specificity of parasites of some embiotocid fishes</p> <p>THURSTON, ROBERT V. Electrophoretic patterns of blood serum proteins from rainbow trout (<i>Salmo gairdneri</i>)</p>	<p>2011-2044</p> <p>2045-2052</p> <p>2053-2068</p> <p>2069-2099</p> <p>2101-2115</p> <p>2117-2136</p> <p>2137-2153</p> <p>2155-2159</p> <p>2161-2168</p> <p>2169-2188</p>

NOTES

<p>Primary production in two small lakes of the northern interior plateau of British Columbia. BY DAVID W. NARVER</p> <p>Pigments from a sockeye salmon (<i>Oncorhynchus nerka</i>) with unusual skin colouration. BY T. P. T. EVELYN</p> <p>Line fishing at Ocean Station P, 50°00'N, 145°00'W. BY R. J. LEBRASSEUR</p>	<p>2189-2193</p> <p>2195-2199</p> <p>2201-2203</p>
<hr style="width: 20%; margin: auto;"/> <p>Recent articles on investigations of the Fisheries Research Board of Canada published in other periodicals.</p>	

OTTAWA
OCTOBER
1967