

3-4. Production Trends and Carrying Capacity of Salmon (Oral-27)

Climate, Growth and Population Dynamics of Western Alaska Chinook Salmon

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Chinook salmon returning to western Alaska represent a major proportion of wild Chinook salmon in North America and Asia. Abundance indices of Yukon, Kuskokwim, and Nushagak Chinook salmon increased after the mid-1970s climate regime shift but declined markedly after the 1997/98 El Niño, which affected many species in the eastern Bering Sea. Growth is often an important factor affecting salmon survival; therefore, we developed growth indices of age-1.3 and age-1.4 Yukon and Kuskokwim Chinook salmon during each year and life stage in freshwater and the ocean, 1964-2004, using measurements of scale growth. Chinook scale growth during each stage at sea was not closely linked to climate shifts (unlike Bristol Bay sockeye salmon). However, we discovered several unique Chinook growth patterns that were consistent among age groups and stocks. Chinook scale growth was dependent on previous-year growth during all life stages except for the homeward migration, e.g., growth during the first year at sea was correlated with growth in freshwater. This pattern may reflect the importance to Chinook salmon of large prey, such as forage fishes and squid, and the greater ability of larger Chinook salmon to capture larger prey and grow faster. Chinook scale growth during the second year at sea was consistently greater during odd-numbered years, leading to greater length of adult age-1.3 Chinook salmon during odd-numbered years. This finding may reflect a cascading trophic link between abundant odd-year pink salmon and Chinook salmon. Unexpectedly, adult female Chinook salmon (age-1.3 and age-1.4) were significantly longer than male salmon. Greater growth of age-1.3 female Chinook salmon began in freshwater, then continued during each remaining life stage; whereas, growth of age-1.4 female Chinook salmon was not significantly greater until the last year at sea and during homeward migration. For both sockeye and chum salmon males are larger suggesting that growth may be especially important to female Chinook salmon. Growth of age-1.3 Chinook salmon began to exceed that of age-1.4 salmon during freshwater, and it was significantly greater than that of age-1.4 Chinook salmon during each subsequent life stage. We also present new preliminary findings suggesting that growth and abundance of Kuskokwim coho salmon, the largest coho stock in Alaska, was dependent on the abundance of pollock larvae during the past four decades. This investigation provides new information about growth and life history patterns of western Alaska Chinook and coho salmon and highlights the need to better understand salmon trophic dynamics of salmon in the Bering Sea.