

Diet of Chinook Salmon in Eastern Lake Michigan, 1991-93

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Abstract.—In recent years, a decline in chinook salmon *Oncorhynchus tshawytscha* abundance in Lake Michigan has been attributed to declining forage availability, increased incidence of bacterial kidney disease (BKD), as well as an interaction between these factors. Concern has also been expressed about the alewife *Alosa pseudoharengus* population's ability to support higher stocking levels of salmonines in the lake. Given these concerns, and the potential biases involved in evaluating chinook salmon diet using sport-caught fish, we conducted a study to evaluate the diet of chinook salmon in eastern Lake Michigan. Graded-mesh nylon gill nets were used to sample chinook salmon. Sampling was designed to determine the influence of chinook salmon size, season, and water depth on diet composition, and to evaluate the relationship between bacterial kidney disease and chinook salmon foraging. Small chinook salmon (≤ 37 cm total length) consumed a higher percentage of insects and other invertebrate food items (up to 26% of stomachs examined) than larger fish (maximum=8% of stomachs examined), but the majority of the diet of small chinook salmon was still fish (29-56% of stomachs). Large chinook salmon (≥ 58 cm) had a fish diet similar to that of small chinook salmon, while medium chinook salmon (38-57 cm) consumed more bloater *Coregonus hoyi* (58% of the diet by weight) than either of the other size groups. Size of prey fish consumed by chinook salmon was strongly dependent on predator size. Seasonal and year-to-year variation in diet was most pronounced for small and medium chinook salmon; diet diversity for these groups generally was highest in summer and increased from 1991 to 1993. Chinook salmon less than 58 cm in length also exhibited significant differences in the relative amounts of three forage fish they consumed, depending upon whether they were collected in water less than or greater than 45 m deep. Small and medium chinook salmon collected in water ≤ 45 m deep consumed more smelt and bloater, while fish collected in deeper water ate primarily alewife. Large chinook salmon in both shallow and deep water fed primarily on alewife. We observed an interaction among chinook salmon stomach fullness, BKD incidence, and season. BKD incidence was highest in May (24%) and declined to 6% by September. On average, BKD-infected fish had twice the percentage of empty stomachs when compared with healthy chinook salmon. Future diet studies of Great Lakes salmonines need to consider temporal and spatial variables, and should focus on the impacts of a shift in diet on growth and angler harvest of chinook salmon, as well as on the potential effects of changes in chinook salmon foraging on other Great Lakes species.