WALLEYE (Stizostedion vitreum) IN BRITISH COLUMBIA: AN EXAMPLE OF HIGH PRODUCTION IN AN INVERTEBRATE-BASED PREY SYSTEM IN THE PEACE REGION


Introduction. Walleye populations in British Columbia (B.C.) represent the western-most limits of the distribution for this species (Scott and Crossman, 1973). Walleye are only native to north-eastern BC within the Peace and Liard river systems, and represent a relatively small component of the diverse provincial fish fauna. Recently, walleye stocked into Lake Roosevelt, Washington, invaded BC waters via the Columbia and Kettle Rivers (MacPhail and Carveth, 1992).

The majority of walleye populations in B.C. are found in rivers of the Peace and Liard watersheds. The only native lacustrine populations in B.C. are found in Maxhamish and Klua lakes (Hopcraft 1993). Walleye have been successfully stocked in Charlie, and Swan lakes, and unsuccessfully into North Cameron lake.

This paper, having provided an overview of the limited walleye distribution in BC, will focus on Charlie Lake. In addition to having the most walleye data available, Charlie Lake is an interesting and unique system. Located 8 kilometres north of Fort St. John, B.C., along the Alaska Highway, it has an unconventional fish stocking history, extremely high nutrient loads, atypical prey composition and a variety of anthropogenic stressors. Despite these conditions, Charlie Lake is an extremely productive walleye system, and it supports angling yields and recreational hours which surpass many others from more southern locales with typical fish communities.

Methods. Data for the Peace Region overview came mostly from syntheses by Hopcraft (1993) and Woods Env. Cons. (2003). Information on Charlie Lake walleye came from a number of internal reports and raw data files spanning the time period between 1984 and 1997. During this time period there were 8 creel, 5 index and 3 seine net surveys, plus various other minor sampling events. Creel data was collected from stratified, access point surveys mostly between May and September, and 2 winter surveys. Gill nets were used for intensive index surveys. Ten sites were chosen, representing a diversity of habitats in Charlie Lake. Standard gillnets 2.4 x 91.4 m. with 6 panels ranging from 25.4 to 76.2 mm. mesh size were used. Seining was done at 5 sites with 1.2 x 7.6 m. nets, with 6.4 mm. mesh. Age and length data was collected for all fish that were sampled.

Creel data provided estimates of catch, effort and yield. To show the combined effect of effort and strong year classes on yield, we calculated an effort-year class index. This index is calculated by multiplying the standardized effort (setting the highest value to 1) by the mean age of the catch.

Fecundity and maturity data came mostly from winter creel surveys, with additional data from creel and index sampling. Although there was sufficient data to estimate fecundity, estimates of maturity rates and mean age to maturity are less reliable because of small sample sizes by age and sex.

Data on food and prey of walleye came from all sampling methods, during the period of 1984 to 1992. Stomach contents were analyzed and reported by general prey group. Here we report the proportion of the sample with various prey items.

Results. Longevity of walleye in Charlie Lake is consistent with other populations, 15 to 20 years, however, they do exhibit lower growth rates, early stunting and smaller asymptotic size than what is commonly reported in the literature (Figure 1).

Angling yields and catch rates for walleye in Charlie Lake are high, by any standard. Over a period of 6 years, CUE and yield estimates averaged 0.9 fish/hour and 5.5 kg/ha/yr, respectively (Figure 2). The effort-year class index appears to correlate well with fluctuations in yield estimates (Figure 2). Estimates of effort average 20 rod-hours/ha annually, well above the value of 10, which has been reported by Baccante and Colby (1991) as the point at which fishing quality declines significantly in less productive lakes of northern Ontario.
Stomach content analysis for a sample of 2187 walleye, indicates that, other than empty stomachs, non-fish prey makes up the greatest percentage of occurrence in the sample (Figure 3). The high proportion of empty stomachs could also likely be due to faster digestion and evacuation rates for invertebrate food items, as opposed to fish prey.

Discussion. Walleye, and a number of other fish species, were introduced in Charlie Lake during the late 1950's, and have since naturalized. Despite the lack of suitable fish prey, the population has flourished, as adult walleye in this lake have efficiently adapted to utilizing planktonic and benthic invertebrates, both abundant in this very eutrophic system.

Lower growth rates and smaller asymptotic sizes are likely due to the relative lack of fish prey in the walleye’s diet. Kelso (1972) reported assimilation efficiencies (ratio of weight of food assimilated to weight of food ingested) significantly lower for invertebrates than fish prey.

Charlie Lake supports angling yields and catch rates which consistently exceed expectations based on estimates from current models. This raises an interesting question: can planktivorous and benthivorous walleye populations support higher yields than piscivorous ones?

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References.


