Influence of Food Web Structure on the Growth and Bioenergetics of Lake Trout *(Salvelinus namaycush)*

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Most fish species tend to feed on larger prey as their size increases. The lack of suitable prey during critical periods of their life can prevent them from shifting diet to larger prey and also from reaching larger body sizes. In this study, we compared the energy budget of lake trout (*Salvelinus namaycush*) populations with contrasting food webs. Non-piscivorous lake trout (NPLT) populations reached a much smaller size and grew at a much slower rate than piscivorous trout (PLT) populations. Food consumption rates were on average, 2-3 times higher in NPLT when they were expressed on a wet weight basis. However, only a slight difference in their energy intake was detected (less than 10%) once consumption rates were corrected for differences in prey caloric content. Growth efficiency was about two times lower in NPLT compared to PLT, while their metabolic costs were higher and assimilation efficiency was lower.

It is most likely that the increased metabolic costs were associated with higher foraging costs, since more feeding attempts must be made to acquire a given quantity of food when fish are feeding on smaller prey. Furthermore, the portion of indigestible matter is likely to be higher in the diet of NPLT than in PLT (e.g., chitin versus bone). These results are consistent with theoretical models of fish growth that have showed that lake trout must have access to larger prey, even if they are rare, to reach larger body sizes. Our study also illustrates how the restructuring of a prey community by the arrival of an exotic species into a food web could alter the growth rate of a top predator. Furthermore, our study suggests that age at first maturity is influence by growth efficiency in indigenous populations of fish. Therefore, the dynamic of a population and its vulnerability to exploitation are likely to be influenced by their energy allocation strategy.