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Assessment of Potential Threats to Arctic Char in Lake Geneva: Bacterial Kidney Disease (BRD).

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Abstract Evaluating the Impact of Bacterial Kidney Disease on Arctic Char Populations in Lake Geneva: A Critical Analysis - This study investigates a significant ecological concern: the notable reduction in Arctic char harvests from Lake Geneva since 1998. This decline is particularly perplexing given the consistent application of existing fishing regulations and ongoing restocking initiatives. Central to this research is the exploration of the hypothesis that Bacterial Kidney Disease (BKD) plays a pivotal role in escalating mortality rates among these fish populations. Utilizing advanced epistemological methodologies, our investigation rigorously identified the presence of BKD through laboratory analyses. Notably, the incidence of BKD in Lake Geneva's Arctic char was found to be relatively minimal, with a prevalence of merely 0.6% in 2004, diminishing to 0% by 2005. Consequently, this study concludes that the presence of BKD, in isolation, is insufficient to account for the substantial decrease in Arctic char catches observed in the region. These findings prompt further research into alternative factors that might be influencing the decline of the Arctic char in Lake Geneva.

Index Terms Salvelinus alpinus, Lake Geneva, Bacterial Kidney Disease, BKD, population dynamics.

I. Summary

Arctic char catches in Lake Geneva have steadily declined since 1998, challenging conventional explanations. The potential influence of Bacterial Kidney Disease (BKD) on increased fish mortality is explored using immunohistology. While BKD is present in Lake Geneva, its occurrence is minimal (0.6 percent in 2004, 0 percent in 2005), insufficient to account for the decline in catches.

II. Introduction

The Arctic char, a historical inhabitant of Lake Geneva, faces a decline in population and catch rates. This study investigates various hypotheses, including inadequate fish management, reduced reproductive success, increased interspecific competition, reduced immunoresistance, and the emergence of Bacterial Kidney Disease (BKD). The study focuses on the last hypothesis, given BKD's potential impact on fish mortality [1], [2].

While the correlation between declining char catches and population reduction is not direct, the study considers BKD as a potential factor, especially amid the observed increase in catches during the 1990s. BKD's role in inducing stress, particularly during reproduction, is explored, suggesting a possible regulatory function depending on population density [3], [4].

BKD, caused by Renibacterium salmoninarum (RS), affects salmonids but not other fish families. The disease can induce kidney dysfunction, limiting osmoregulation and causing mortality, especially in smolts. The study aims to answer questions regarding BKD's presence, proportion, and its potential to induce significant mortality in the wild char population [5].

III. Material and Methods

Laboratory Detection Methods

The study evaluates three diagnostic methods for BRD: [6]

- selective agar (SKDM)
- non-selective agar (KDM)
- immunohistology using monoclonal antibodies

Immunohistology proves effective in diagnosing BKD.

Sampling Campaigns

Two sampling campaigns are conducted in 2004 and 2005, involving 331 and 142 Arctic char, respectively. Clinical signs and immunohistological analysis reveal a low prevalence of BKD (0.6 percent in 2004, 0 percent in 2005) [7].

Laboratory Analysis

Histological sections of kidney samples from potentially infected fish reveal BKD presence in two individuals (0.6 percent infection rate) [8].

IV. Results

Laboratory Detection Results

The bacterial strain proves difficult to cultivate, but immunohistology demonstrates BKD presence effectively.

Sampling Campaign Results

While some individuals show clinical signs, only two cases (0.6 percent) confirm BKD infection in 2004. No clinical signs are observed in 2005, indicating a minimal infection rate.

V. Discussion

Presence of BKD

BKD is confirmed in Lake Geneva, but the extremely low infection rate suggests it is not the primary cause of the observed decline in char population.

Other Hypotheses

The study rejects the hypothesis that BKD is the main contributor to the decline. Further investigations into fish management and pike predation are suggested to understand the ongoing decline in char catches [9].

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