Poster 299_2

Vaterite deformation development in rewilded atlantic salmon and it's effect on mortality

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Why are salmon rewilded in dammed rivers

An increasing number of the world's river are subjected to damming preventing anadromous species like salmon from reaching their spawning grounds. In order to compensate for the damage to the salmon population juvenile salmon from hatcheries are restocked into the rivers. This policy has however have limited success.

What is vaterite deformation

Vaterite deformation is a change in the molecular structure of aragonite. This causes the otoliths to get a crystal like appearance. Otoliths are an important of the hearing system of salmon. Vaterite in the otoliths has been found to decrease hearing and spatial awareness by up to 50%. It is also believed to impact welfare. Factors like fast growth time and stress i believed to be some of the main causes of vaterite deformation.

Vaterite deformation is significantly higher in salmon grown in hatcheries compared to wild salmon. This is due to factors like stress and high growth. The fish used for rewilding rivers are often produced in hatcheries and does therefore have more vaterite then wild salmon.

How does vaterite deformation develop under different conditions

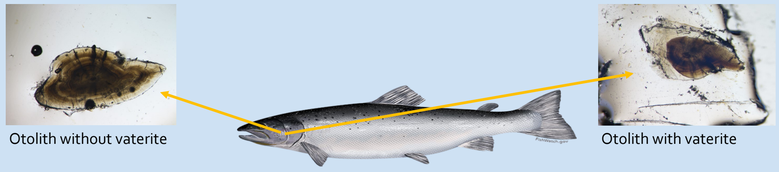
This study looks at vaterite deformation in rewilded salmon otoliths from two different years. Restocked salmon are juvenile salmon grown in hatcheries that are often released in dammed rivers to compensate for the ecological damage of the damming. One year had normal conditions while the second had a once in a 200 year flood. The aim of the project is to find out

How was the data collected

The data was collected from two different rivers in the Voss region of western Norway. Released salmon were captured and killed in order to get their otoliths. These were then cleaned and smoothed.

Pictures of the otoliths were taken from a microscope. Afterwards a program called ImageJ was used to calculate the size of vaterite deformations in the otoliths and their proportion.

SCAN ME



Proportion of vaterite in otoliths

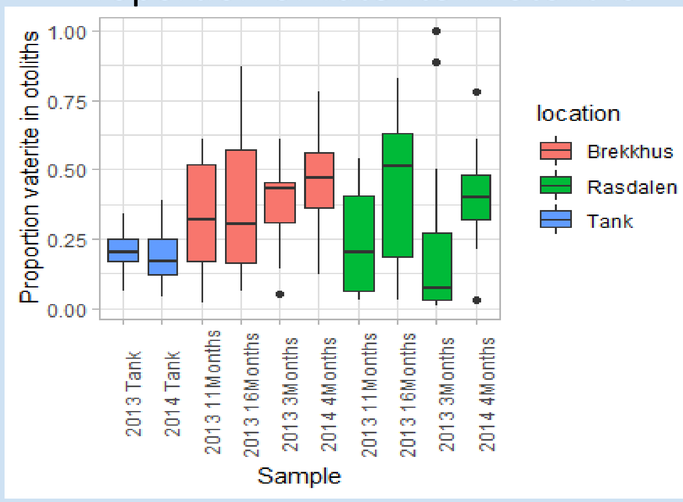


Figure 1: Boxplot showing average proportion of vaterite in the otoliths of different samples. X-axis shows time released and time before recapture. Y-axis shows the proportion of vaterite in the samples. The colour indicates location.

Percentage of salmon with vaterite

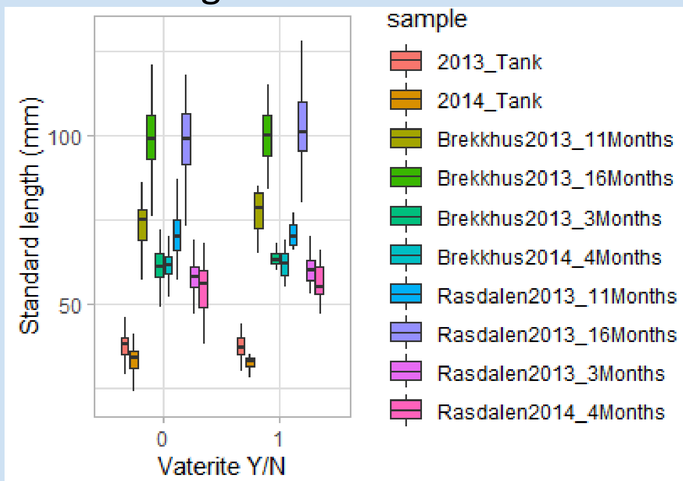


Figure 2: Boxplot showing how many otoliths for each sample that has vaterite. X axis shows if it has vaterite or not. 1 indicates vaterite and 0 indicates no vaterite. Y axis shows the average length of the salmon. The colour shows the different samples as well as their location, release time and time before recapture.

Key findings

1. The proportion of vaterite in otoliths generally increases over time until a certain level.

2. Flood conditions significantly increases the proportion of vaterite in otoliths. This effect is seen for both young and older salmon.

3. The percentage of salmon with vaterite is larger or equal under normal conditions but will mostly decrease under flood conditions indicating increased mortality.

Discussion

The results shows a general increase in vaterite proportion in otoliths over time. This means that the vaterite deformation will continue to grow even after the juvenile salmon is released. The growth does however seem to slow down. The flood also seems to amplify vaterite growth as the proportion of vaterite otoliths increases at both locations. Figure 2 shows that the percentage of salmon with vaterite decreases under flood conditions indicating that their mortality is higher under those conditions.

There are however some interesting outliers. Figure 1 shows that the average vaterite proportion in Brekkhus decreases from 11 months to 16 months. Figure 2 shows that in the same samples the percentage of fish with vaterite decreases. This indicates that the mortality of vaterite fish was higher under flood conditions as it is unlikely that new vaterite deformations develop under the released conditions.

In Rasdalen there is a decrease in the average vaterite proportion in otoliths after 3 months as shown by Figure 1. In Figure 2 however the percentage of salmon with vaterite has increased. This is likely explained by the fact that some of the juvenile salmon had not visibly begun developing vaterite yet and juveniles with newer vaterite deformation pull down the average proportion.