

NRP Endocrine Disruptors

Final Summary

Original project title Gonad malformations of whitefish (<i>Coregonus lavaretus</i>) in Lake Thun: are they induced by endocrine-active compounds (EACs) ?
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Project number 4050-066552

Gonad malformations of whitefish in Lake Thun

The to date available weight-of-evidence does not support the hypothesis that the gonad malformations of coregonids from Lake Thun are related to exposure to estrogenic or androgenic compounds

Research questions

High frequencies of gonad morphological alterations have been observed in whitefish (*Coregonus lavaretus*) from Lake Thun. The project aimed to examine whether these malformations are related to endocrine-active substances (EACs) by asking: (1) are the alterations specifically associated with Lake Thun, and are they inducible by the Lake Thun environment ? (2) is there evidence for the presence of endocrine-active compounds (EACs) in Lake Thun and for a role of EACs in the development of the gonad alterations ? We focused on compounds interfering with the sex steroid system, since these substances are able to induce microscopical and macroscopical changes of gonad morphology.

Results

Gonad malformations are specifically associated with Lake Thun, and within the lake, they are mainly expressed in one morph, the Brienzzlig. The gonadal alterations develop concomitantly with gonad differentiation. The question whether the malformations are inducible by long-term exposure of coregonids to water, sediment or plankton of Lake Thun cannot be answered yet due to an accidental loss of the experimental groups and the resulting delay in the project schedule. Exposure to and effects of EACs were examined using bioanalytics and biomarkers as well as laboratory exposure experiments. Analysis of three endocrine disruption biomarkers - intersex gonads, vitellogenin levels and sex steroid levels - provided no indication of EAC exposure, neither in fish with normal nor with abnormal gonad morphology. Bioanalytical studies demon-

strated estrogenic activities in plankton extracts of Lake Thun but also in plankton of a reference lake. Bioassay-directed fractionation of the plankton samples points to degradation products of natural substances as cause of the estrogenic activity. Long-term laboratory exposure of whitefish to 17beta-estradiol resulted in a dose-dependent increase of intersex gonads, but not of the other malformations being present in Lake Thun coregonids.

Perspectives

Although the project is not completed yet, the to date available weight-of-evidence makes an involvement of EACs in the gonad malformations unlikely. The project highlights the need for more detailed knowledge of variations in wildlife populations to be able to recognize anthropogenic impacts.