Schools taking part in a research project investigating dioxins in fish

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Main objective

Education
Engage youths on a global scale in environmental science through active participation in a research project

Research
Use of a novel research technique (CALUX) to determine the dioxin concentrations in fish (recreational fishing)

Target group
Pupils in schools all over the world, 13-18 years old
General motivation

- Increase knowledge and consciousness about environmental topics
- Inspire youngsters to take an interest in environmental and natural sciences
- Involving in authentic research projects where they are working as scientists
Invitation and contact with schools

- Invitation facilitated by Norwegian Centre for Science Education
- World-wide through «the GLOBE program» network-A Worldwide Science and Education Program - https://www.globe.gov/
- Communication via e-mail and supported through the website http://sustain.no/projects/globalpop
- Written guidelines and video for fish sampling and preparation following scientific standards
- Two parts: practical hands-on activities and a more theoretical web-based documentation and reporting
Concrete activities for the students

- Excursion
- Fishing, GPS
- Scientific handling
- Datasheet
- Weight and length
- Web publishing
- Marking and packing
Global POP

Activity: Global POP  
Programme: sustain.no
Date: 2007-11-02
School: Tromsødalen videregående skole
Site: Fjellfrøsvatnet (Troms, Norway)

REGISTERED DATA

<table>
<thead>
<tr>
<th>Datasheet</th>
<th>Value</th>
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<tbody>
<tr>
<td>Date</td>
<td>02.11.2007</td>
</tr>
<tr>
<td>Map coordinates</td>
<td>69° 5' 6&quot; North, 19° 20' 19&quot; East</td>
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<tr>
<td>Fish species</td>
<td>Trout (Salmo trutta)</td>
</tr>
<tr>
<td>Local name</td>
<td>ørret</td>
</tr>
<tr>
<td>Fish sample ID</td>
<td>Tromsdalen 1</td>
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<tr>
<td>Sampling method</td>
<td>Net</td>
</tr>
<tr>
<td>Weight of body</td>
<td>136 g</td>
</tr>
<tr>
<td>Length of fish</td>
<td>260 mm</td>
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<tr>
<td>Weight of gonad</td>
<td></td>
</tr>
<tr>
<td>Length of gonad</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
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<tr>
<td>Maturation stage</td>
<td>Immature</td>
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<tr>
<td>Sampled otoliths</td>
<td>no</td>
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<tr>
<td>Sampled scales</td>
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<td>Near industry</td>
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<tr>
<td>Description of the site</td>
<td>Freshwater lake, 6,71 m2, 125 over sealevel</td>
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</table>

Other samples from this school
View world map
Dioxins

- Unwanted by-product, combustion processes
- Known to be one of the most toxic group of chemicals
- Species dependent toxicity (cancer hazard to people)
- Damage the immune system and interfere with hormonal systems
- Dioxin binds to Ah receptor. The receptor, when bound to dioxin, can then bind to DNA and alter the expression of some genes.
Dioxin analysis

- Normal GC/MS analysis of single compounds expensive and time consuming
- The need for more rapid screening and less expensive method
- BDS DR CALUX® bioassay method was used
- Measure total response of all compounds binding to Ah-receptor (dioxin and dioxin-like PCBs)
- Results was uploaded the sustain website, following the unique sample ID
Bioassay method

BDS-DR CALUX use a line of liver cells from rat to analyze dioxins

- Extract from fish was added to rat liver cells and we measure the biological response
- Cells are modified with a gene that produces luciferase
- The cells give light under exposure of dioxins
- Quantity of light given by cells is a measure of dioxins
Results

203 samples from 54 school in 13 countries

No previous published fish data with CALUX from Norway and very few international studies
Outreach sustain.no

- Outreach via web to schools, society, national and international governments
- 3 workshops for teachers
- Fish from areas not previously investigated
- Important for the local communities
  - Recreational fishing – food safety
- Novel data for the research communities and national/international management
What have the pupils learned?

• The pupils have worked as researchers
• Followed a scientific method and done the same work as a researcher
• Their own local fish, ownership to sample and results, sense of pride
• Knew that their work and effort was important for the result and success of the project
• For future: more close contact with the schools, teachers and students
• Encourage evaluation from schools, important for the success and validation
Some evaluation from schools

French girl school: COLLEGE ANDRE LAHAYE

“Everyone had her own task (measure the weight, do the fillet, find the gonads...). Time went so fast, it was like a “non school time”. But fish smelt bad, and reading data, analyze them was not so easy for us.”

The teacher:

“It was a great experience for me as a teacher, my students were so involved in that project. Some of them showed Highschool students how to do the sampling (look below the two French newspapers articles).

We learned how to follow a protocol, how to work together, climate changes and global environment questions became real for most of our students.”
Thank you for your attention!

Publications:

  Chapter 6: Heimstad et al. Schools Taking Part in a Research Project Investigating Dioxins in Fish