Schools taking part in a research project investigating dioxins in fish

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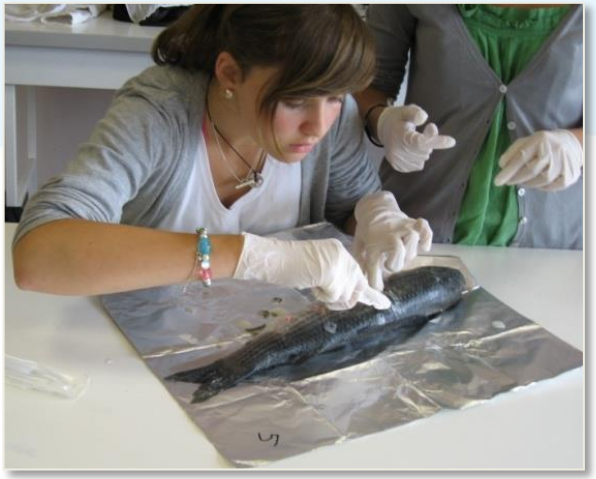
Main objective

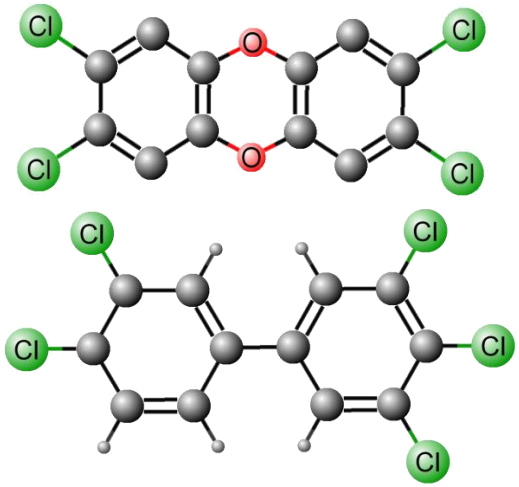
Education

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

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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

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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

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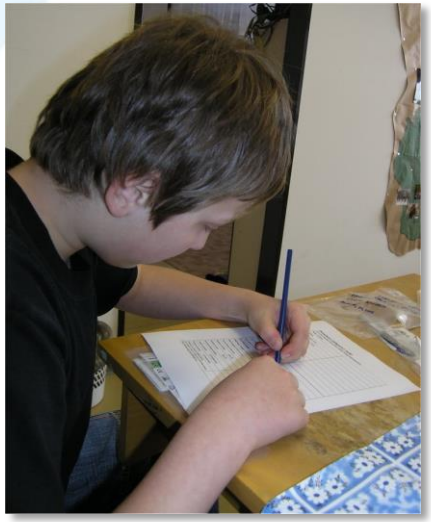
Concrete activities for the students

Excursion

Fishing, GPS

Weight and length

Scientific handling



Datasheet

Marking and packing

Web publishing

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Home
Choose activity
Choose project
Enter data
View results
View participants
Become a participant!

Global POP

Activity: Global POP — Main page | Show results
Programme: sustain.no
Date: 2007-11-02 — All dates
School: Tromsdalen videregående skole — Participants page
Site: Fjellfrøsvatnet (Troms, Norway) — Site page

REGISTERED DATA

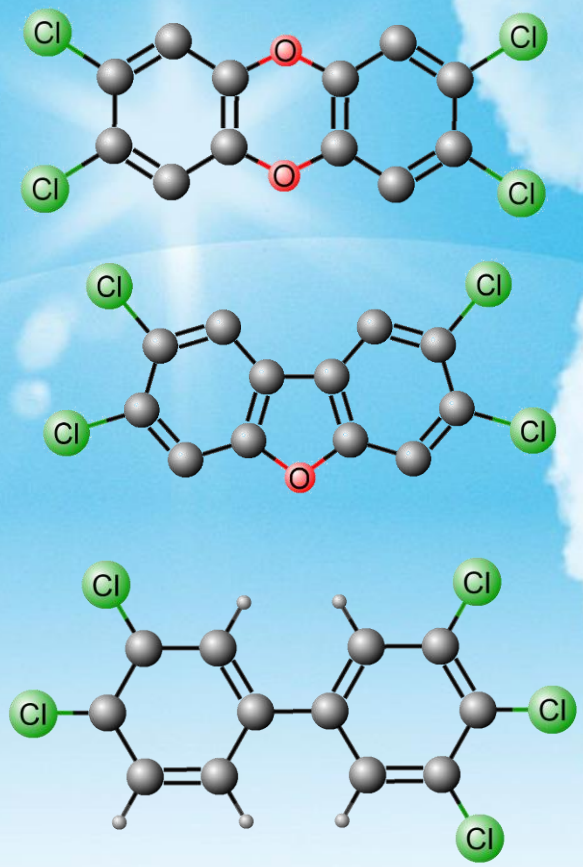
Datasheet	
Date	02.11.2007
Map coordinates	69° 5' 6'' North, 19° 20' 19'' East
Fish species	**Trout** *(Salmo trutta)*
Local name	ørret
Fish sample ID	Tromsdalen 1
Sampling method	Net
Weight of body	136 g
Length of fish	260 mm
Weight of gonad	
Length of gonad	
Gender	Female
Maturation stage	Immature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

Other samples from this school
View world map

Dioxins

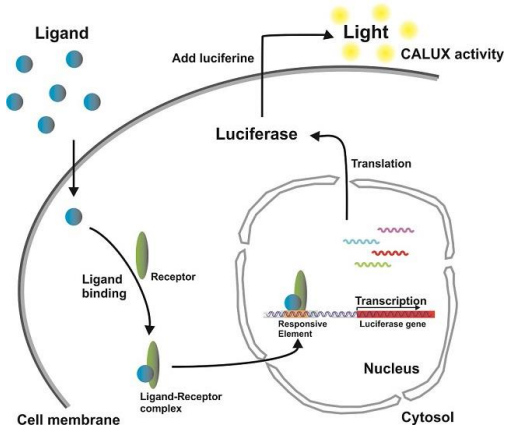
- Unwanted by-product, combustion processes
- Known to be one of the most toxic group of chemicals
- Species dependent toxicity

  (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

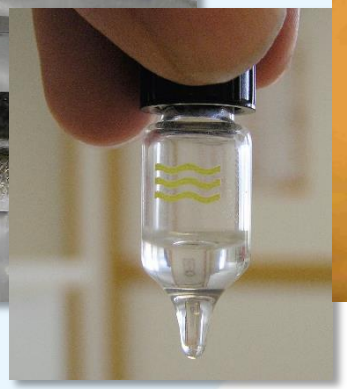
- Normal GC/MS analysis of single compounds expensive and time consuming
- The need for more rapid screening and less expensive method
- BDS DR CALUX® bioassay method was used
- Measure total response of all compounds binding to Ah-receptor (dioxin and dioxin-like PCBs)
- Results was uploaded the sustain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



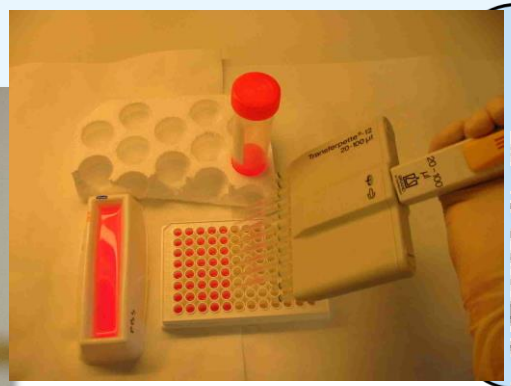
Bioassay method

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

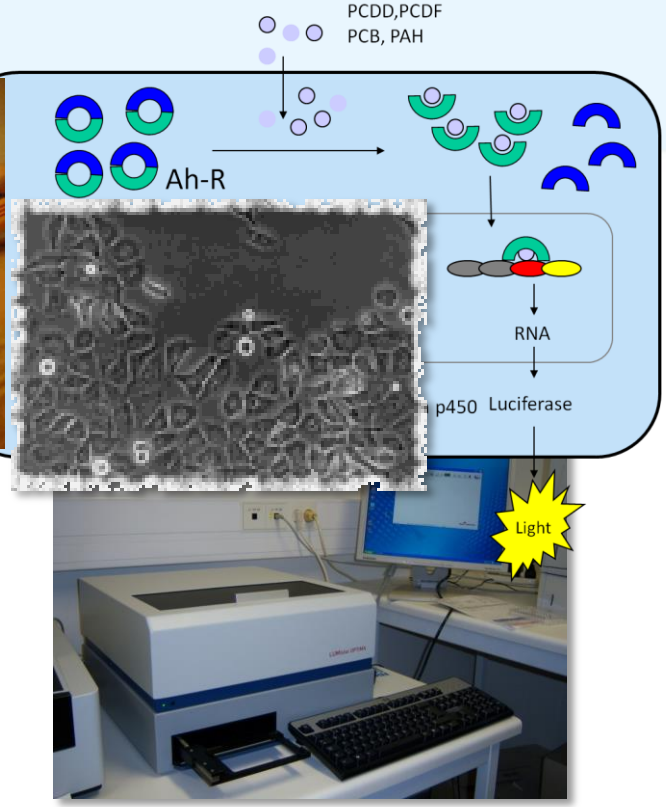
Fishfilet



Extract



Liver cells



Luminometer

- 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

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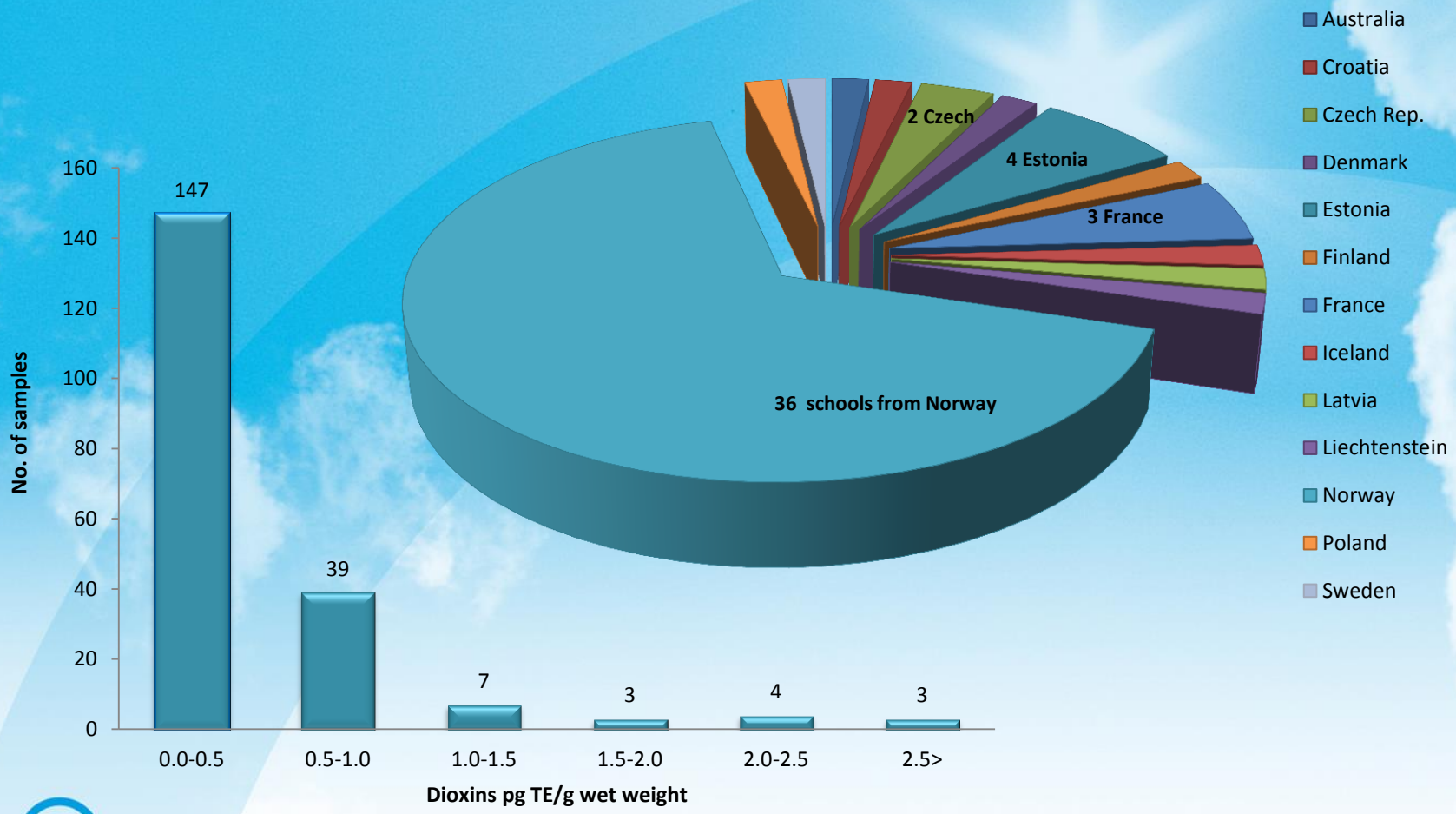
Results

203 samples from 54 school in 13 countries



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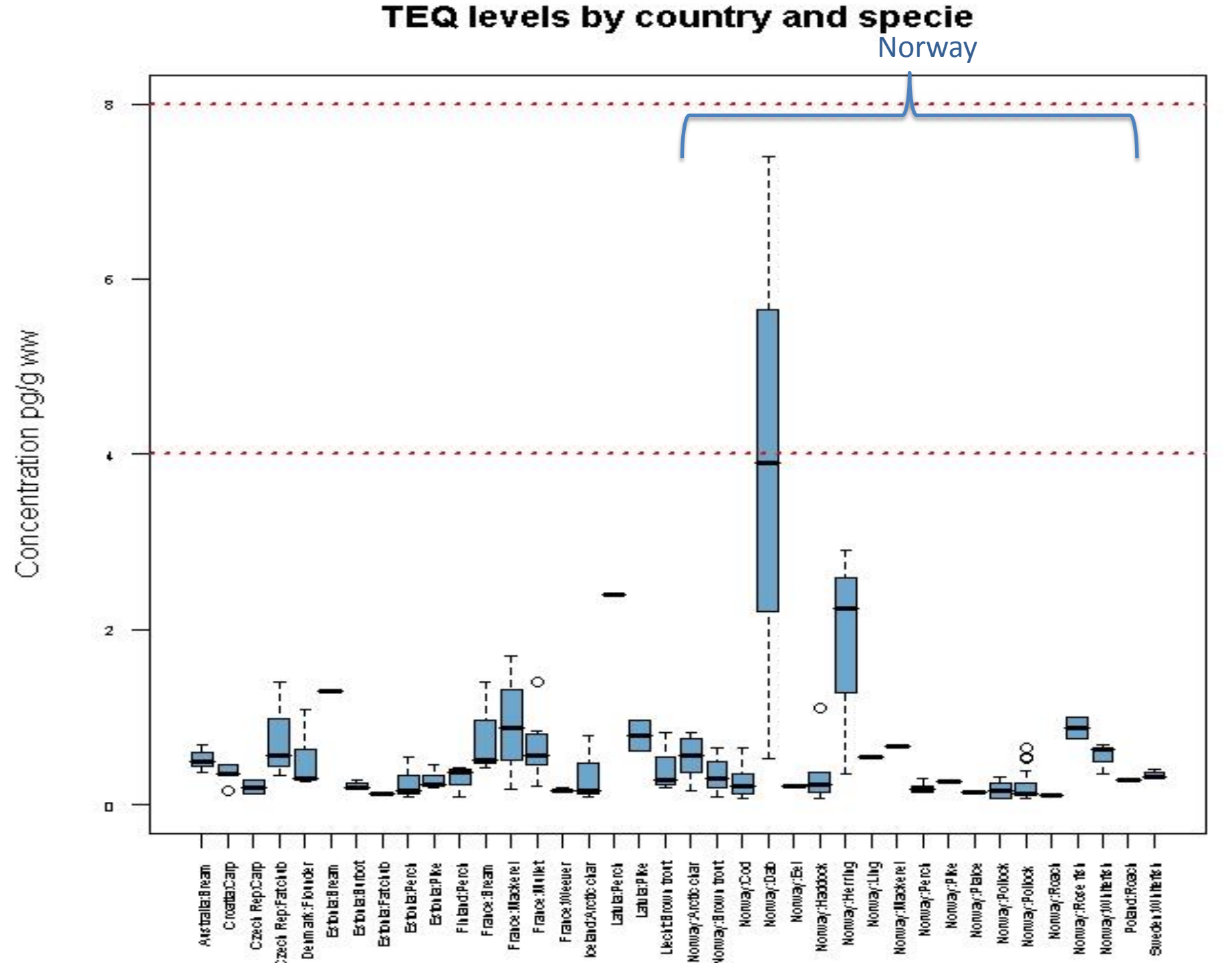
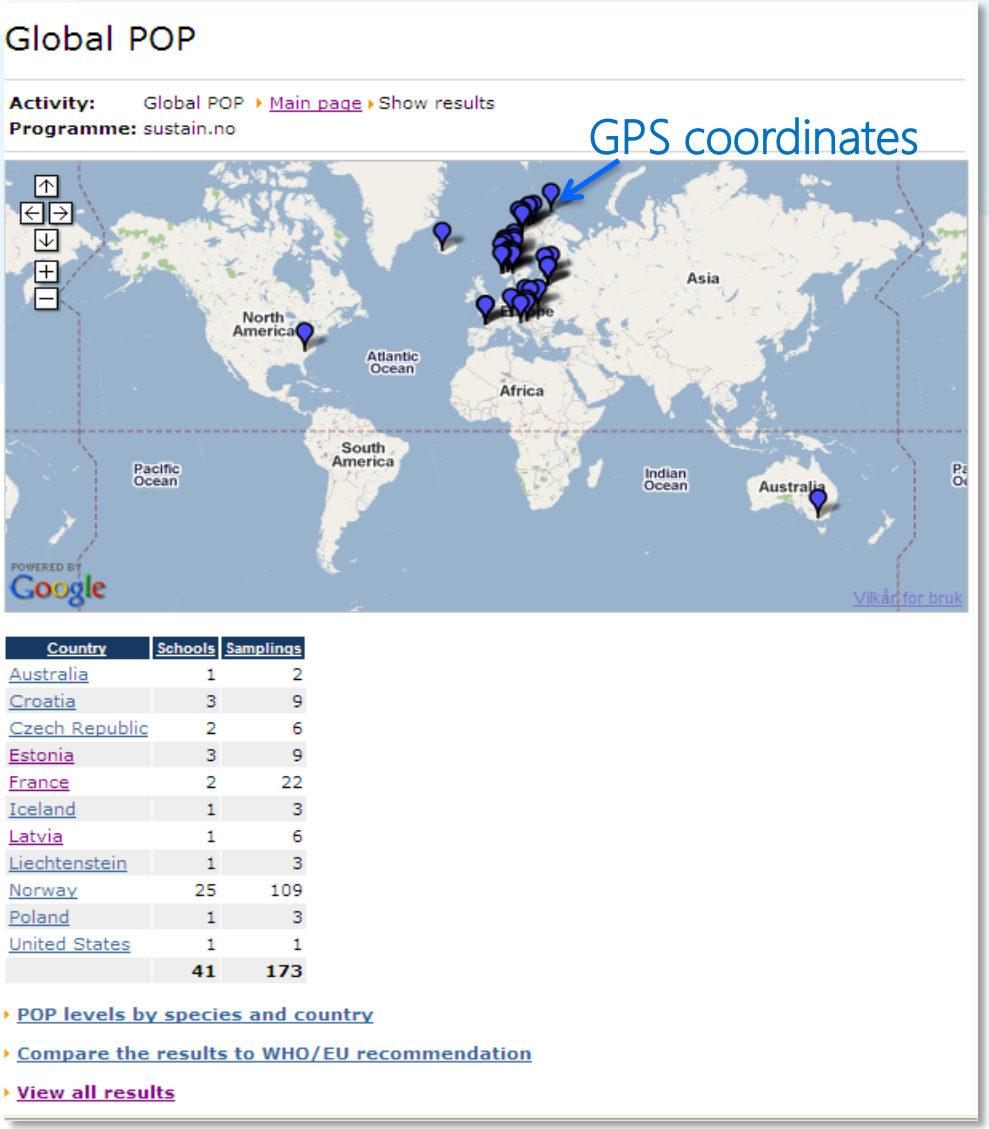
No previous published fish data with CALUX from Norway and very few international studies


TEQ levels by country and specie
Norway
Concentration pg/g ww
0
2
4
6
8
Australia:Bream
Croatia:Carp
Czech Rep:Carp
Czech Rep:Fatcrib
Denmark:Flounder
Estonia:Bream
Estonia:Burbot
Estonia:Fatcrib
Estonia:Perch
Estonia:Pike
Finland:Perch
France:Bream
France:Mackerel
France:Mullet
France:Mullet
Iceland:Arctic char
Latvia:Perch
Latvia:Pike
Lech:Brown trout
Norway:Arctic char
Norway:Brown trout
Norway:Cod
Norway:Dab
Norway:Eel
Norway:Haddock
Norway:Herring
Norway:Ling
Norway:Mackerel
Norway:Perch
Norway:Pike
Norway:Plaice
Norway:Pollock
Norway:Pollock
Norway:Roach
Norway:Rose fish
Norway:Whitefish
Poland:Roach
Sweden:Whitefish

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 managment



Country	Schools	Samplings
Australia	1	2
Croatia	3	9
Czech Republic	2	6
Estonia	3	9
France	2	22
Iceland	1	3
Latvia	1	6
Liechtenstein	1	3
Norway	25	109
Poland	1	3
United States	1	1
	41	**173**

▸ POP levels by species and country
▸ Compare the results to WHO/EU recommendation
▸ View all results

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."

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Thank you for your attention!

Publications:

-Book: Implications and Consequences of Anthropogenic Pollution in Polar Environments. (2016) Editors: Roland Kallenborn. ISBN: 978-3-642-12314-6. Chapter 6: Heimstad et al. Schools Taking Part in a Research Project Investigating Dioxins in Fish

- Heimstad et al. (2015). A survey of dioxin-like contaminants in fish from recreational fishing. *Environ Monit Assess* 187: 509

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