EMRAS – II Working Group 6; Biota Effects

Ongoing work of group

...interested in understanding radiological impacts to the environment...

5 SUBTASKS

TASK 1: FREDERICA Update

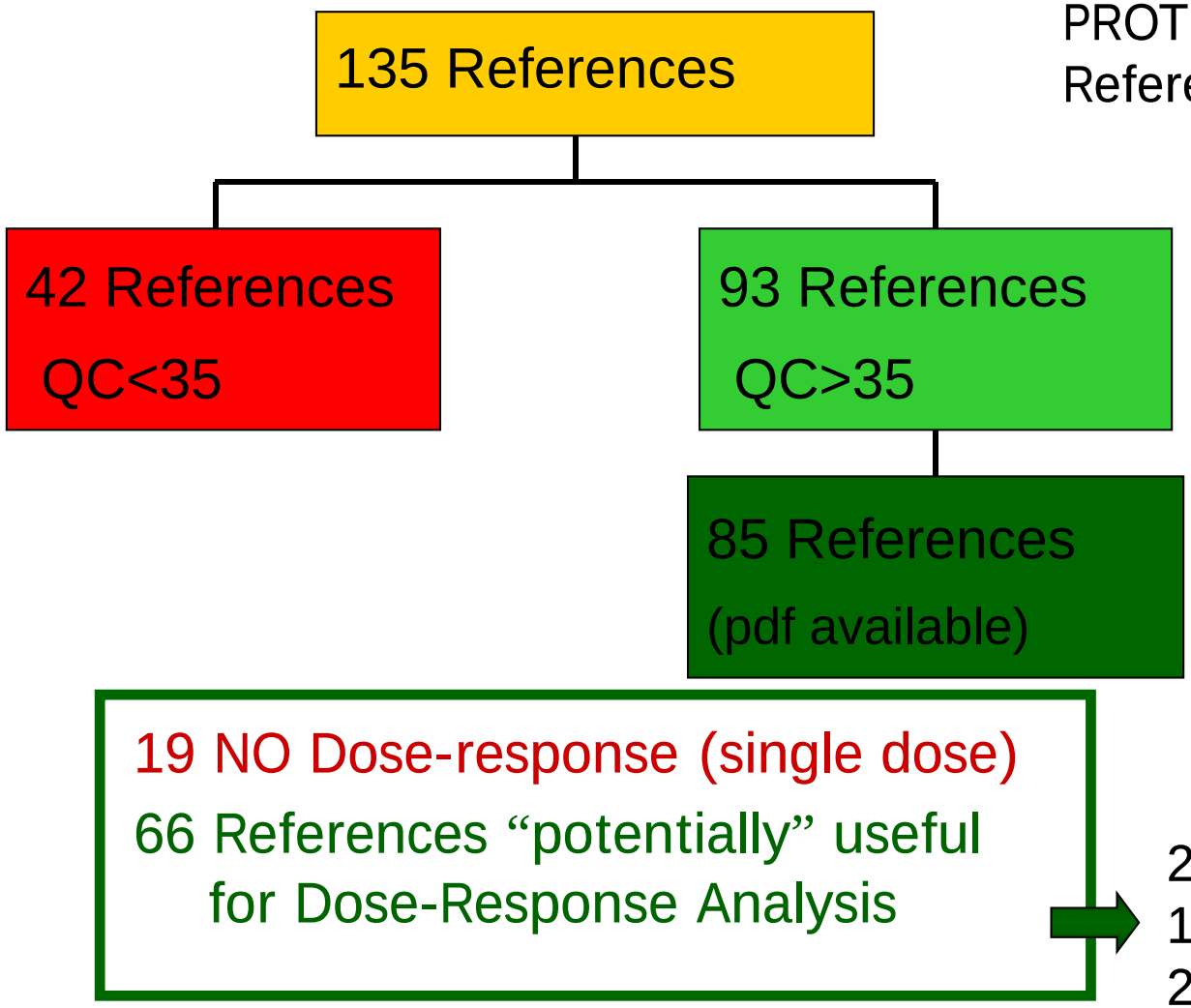
Almudena REAL, CIEMAT

- Literature survey
  - ✓ New data 2006-2009
  - ✓ Japanese literature
  - ✓ Russian literature
  - ✓ Data “missing” (UNSCEAR 1982; Turner 1975; EA; Tatiana)
- Add new data to FREDERICA database
- QA/QC and score new entries

Belgium (SCK-CEN): Nele Horeman; Hildegarde Vandenhove
Germany (BfS): Christine Willdrot
Japan (NIRS): Satoshi Yoshida, Dr Fuma, Maruyama
Russian Federation (Ecomod; RIARAE): Tatiana Sazykina, Stanislav Geraskin
Spain (CIEMAT): Almudena Real
Sweden (Vattenfall & SU): Synnove Sundell-Bergman, Karolina Stark
United Kingdom (EA): Laura Newsome; David Copplestone

FREDERICA Update: Quality-Control Analysis

PROTECT Project: SSD analysis
References with QC >35 points



FREDERICA Update: Russian Literature Database

Stanislav Geraskin. Russian Institute of Agricultural Radiology & Agroecology (RIARAE)

33 Refs (5 already in FREDERICA, but incomplete)

All but 1 QC > 35

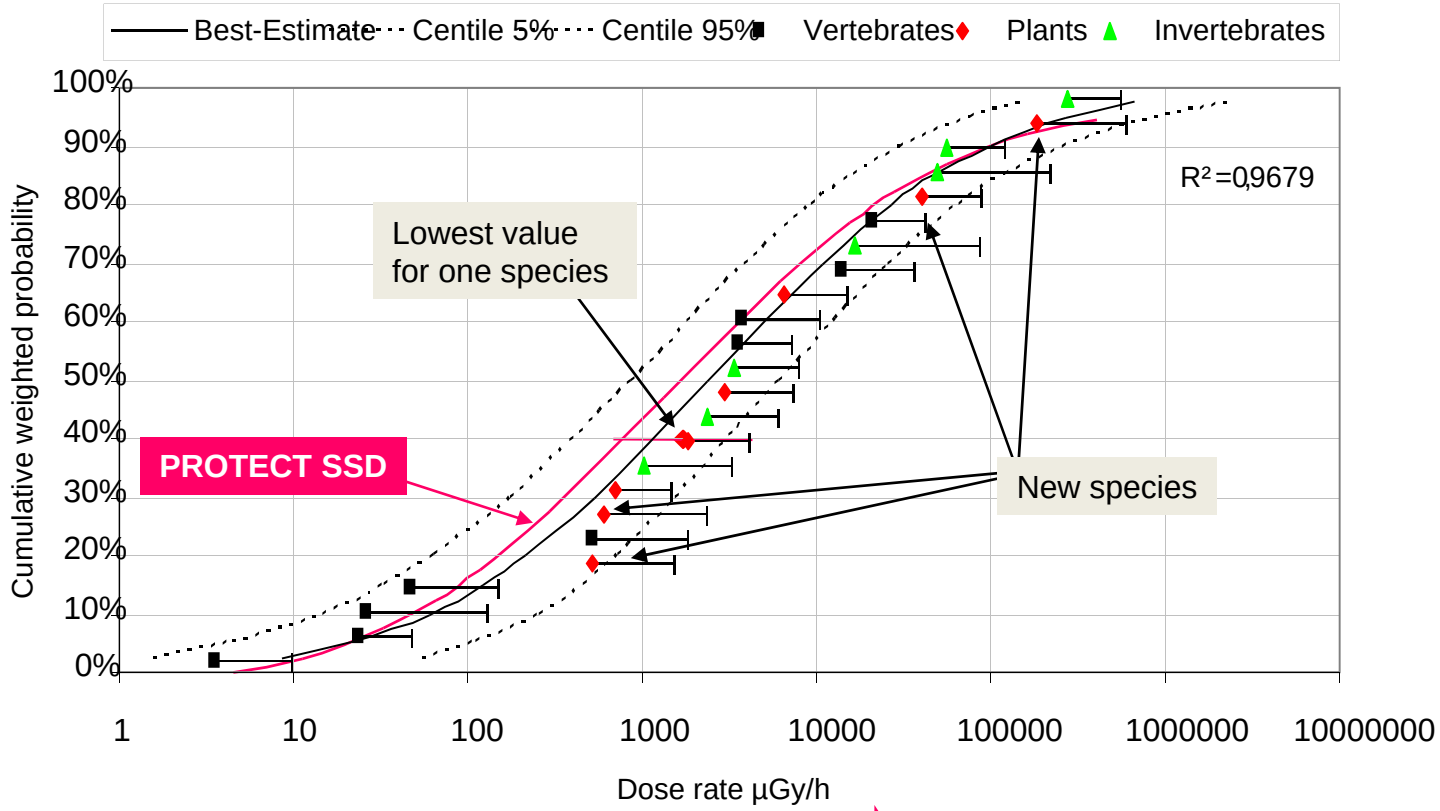
- Chronic exposure; Field studies: Chernobyl; Mayak; Komi Republic; Semipalatinsk; Taiga (Underground nuclear explosion); Vrangel Island.
- Wildlife groups: Plants (51%: 18 Refs); Mammals (34%: 12 Refs); Insects (6%: 2 Refs); Invertebrates (6%: 2 Refs); Fish (3%: 1 Ref)
- Endpoints: Mut (35 %); Morb (25 %); Repr (20 %); Mort (7 %); Others (Adaptation; Ecology (13 %))

WG-6 of EMRAS-II: 192 Refs

TASK 2: Species Sensitivity Distributions

Chronic External Gamma Irradiation

Jacqueline Garnier-Laplace, IRSN



20 species **HDR_5 = 17 µGy/h [2-211]** **AF=2** **(benchmark//PNEDR) 10 µGy/h**

24 species **HDR_5 = 21 µGy/h [4-150]** **AF=2** **(benchmark//PNEDR) 10 µGy/h**

TASK 3: ANALYSIS OF THE CANADIAN BENTHIC DATABASE

Claire Della - Vedova (magelis company)

Jacqueline Garnier – Laplace (IRSN)

PREVIOUS to EMRAS….

Univariate approach (contaminant by contaminant) :

Environmental Monitoring and Assessment (2005) **110:** 71–85
DOI: 10.1007/s10661-005-6291-0

DERIVATION AND USE OF SEDIMENT QUALITY GUIDELINES FOR ECOLOGICAL RISK ASSESSMENT OF METALS AND RADIONUCLIDES RELEASED TO THE ENVIRONMENT FROM URANIUM MINING AND MILLING ACTIVITIES IN CANADA

P. A. THOMPSON*, J. KURIAS and S. MIHOK
Canadian Nuclear Safety Commission, Station B, 280 Slater Street, Ottawa, Canada
*(*author for correspondence, e-mail: thompsonp@cnsc-ccsn.gc.ca)*

(Received 5 August 2004; accepted 12 November 2004)

METHOD –STATISTICAL ANALYSIS

What we decided to do :

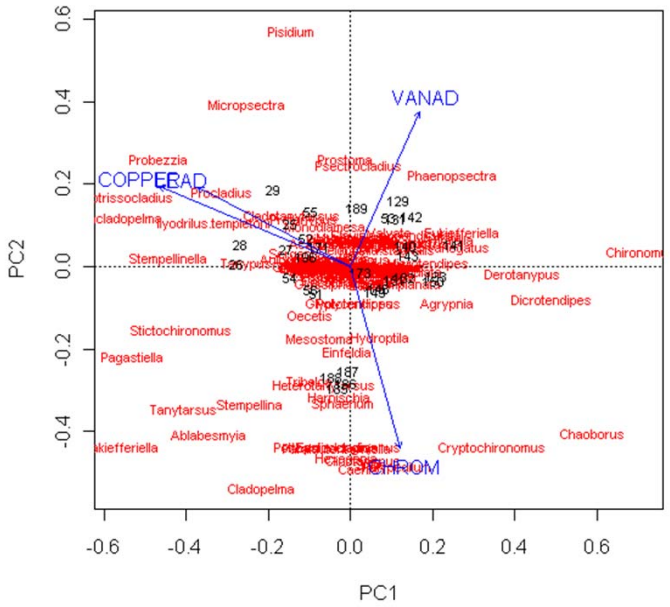
1. Investigate the contaminants which influence the distribution of the species by means of ordination methods classically used in this situation but which can be applied only to datasets containing no missing data, so to our "compete data" set :
   a) constrained ordination method (Redundancy Analysis - RDA) and
   b) unconstrained ordination method (Principal Components Analysis-PCA) with vectors fitting approach

2. And to develop a method allowing to bring to light the contaminants which influence the distribution of the benthos, even when the dataset contains missing data
   a) use the developed method with "all data" set
   b) Use the developed method with "complete data" set

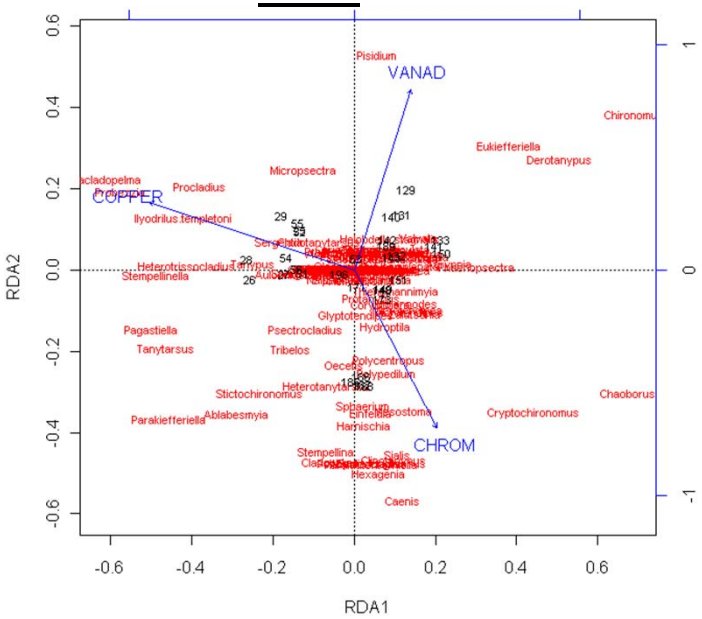
PCA vs RDA

Results

PCA and vectors fitting



RDA



RESULTS

Comparison of the patterns observed

"all data"

3

[u] +
[PB^{210}]+
[PO^{210}]+
Procladius : 25.4%
Tanytarsus : 21%
Cryptochironomus :14.7%
Polypedilum : 13.1%
Chironomus : 11.3%

2

[u] -
[Se]-
Microspectra : 39.9%
Heterotrissocladius :33%
Sergentia :21.4%
Chironomus : 19.9%
Ryacodrilus montana :15.2%

1

[u] -
[PB^{210}]-
[PO^{210}]-
[Se]+
Chaoborus : 45.6%
Chironomus : 39.1%
Procladius : 21.5%
Limnodrilus : 12.6%
Pisidium :10.3%

PO210+, PB210+ : procladius (25.4% and 30.2%)

PO210-, PB210- : Chironomus (39.1% and 34.3%), Chaoborus (45.6% and 18.2%), Pisidium (10 and 15.7%) but Procaldius (21.5% and 20.12%)

"complete data"

A

[Lead]+
[Copper]+
[PB^{210}]+
[$P0^{210}$]+
[Moly] -
Procladius : 30.2%
Pisidium : 20.9%
Probezzia : 20.2%
Heterotrissocladius :19.7%
Tanytarsus : 16.9%

B

[Arsenic] -
[Vanadium]-
Chironomus : 22.9%
Procladius : 22.9%
Polypedilum : 22.9%
Tanytarsus : 22.9%
Cladopelma : 21%

C

[Arsenic] +
[Moly]+
[vanadium]+
[PB210]-
[P0210]-
[Lead]-
[Copper]-
Chironomus : 34.3%
Dicrotendipes : 23.4%
Procladius : 20.12%
Chaoborus : 18.2%
Pisidium : 15.7%

TASK 4: Multiple Stressors Task Group

(*Leader: Hildegarde Vandenhove; SCK-CEN)*

Literature Survey: Multi-stressor data with radiation being one of the stressors

- **Terrestrial plants**
  - Before QC analysis: 6
  - After QC analysis: **5**
- **Aquatic plants**
  - Before QC analysis: 1
  - After QC analysis: **1**
- **Terrestrial animals**
  - Before QC analysis: 22
  - After QC analysis: **10**
- **Aquatic animals**
  - Before QC analysis: 4
  - After QC analysis: **4**
- **Freshwater microcosm**
  - Before QC analysis: 1
  - After QC analysis: **0**
- **Marine estuarine**
  - Before QC analysis: 19
  - After QC analysis: **13**

QUALITY CONTROL ANLAYSIS

Workshop on Mixture Toxicity

SCK•CEN
STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE

Workshop on Mixture toxicity

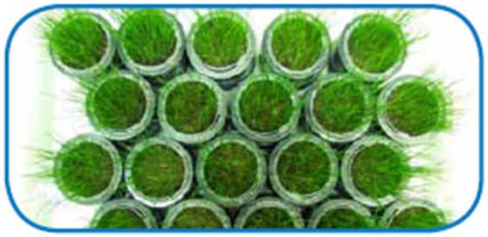
September 22-24, 2010

© Dries Knapen

Venue

SCK•CEN, Mol, Belgium

Belgian Nuclear Research Centre, SCK•CEN
Club-House, Boeretang 201, 2400 Mol, Belgium



Objectives

Contaminants never occur in isolation, yet legislation is still largely based on effects of single compounds. In addition, more and more data are becoming available that suggest that compounds can exert effects in organisms when present in mixtures in concentration ranges at which the single contaminants do not induce effects.

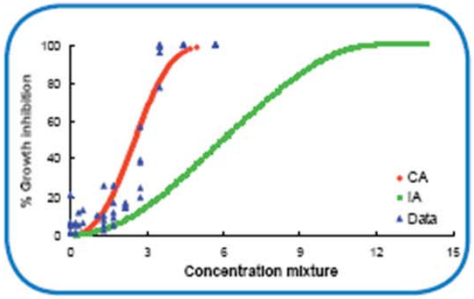
The examination of combined exposures, which corresponds much more realistically to exposure conditions in the environment than the analysis of single substances, entails major methodological difficulties in the experimentation and evaluation procedure.

This workshop intends to introduce you to some of the approaches and methodologies used in studying and predicting mixture toxicity effects. The workshop will be a mixture of lectures, exercises and open discussions.

More information
www.sckcen.be/en/Events/MIXTOX

Target audience

This workshop intends to attract PhD students and scientific researchers. As the general concepts discussed in this workshop apply to different fields of research, participants of all fields of (eco) toxicology are welcome.



Organisation

This workshop is organized by the unit Biosphere Impact Studies (BIS) from the Belgian Nuclear Research Centre (SCK•CEN).
It is organized in the framework of the IUR-IAEA Practical Arrangements for the exchange and dissemination of information within the EMRAS II project, Working Group 6 on Biota dose effects modelling - Multiple Stressors.

IUR International Union of Radioecology
IAEA International Atomic Energy Agency
Atoms for Peace

Programme

Wednesday September 22, 2010

08:30	Opening and registration
09:00	Introduction *Frank Hardeman, SCK•CEN, Belgian Nuclear Research Centre, Belgium*
09:30	Mixture toxicity concepts and Risk assessment *Thomas Backhaus, University of Göteborg, Sweden*
11:00	Break
11:15	Mixture toxicity concepts and Risk assessment *Thomas Backhaus*
13:00	Lunch
14:00	Mixture toxicity concepts and Risk assessment *Thomas Backhaus*
15:00	Break
15:15	Calculus session *Nele Horemans and Nathalie Vanhoudt, Biosphere Impact Studies, SCK•CEN, Belgium*
18:30	Welcome reception

Thursday September 23, 2010

09:00	Deviations from Concentration Addition and Independent Action *Claus Svendsen, Centre for Hydrology and Ecology, UK*
11:00	Break
11:15	Deviations from Concentration Addition and Independent Action *Claus Svendsen*
13:00	Lunch
14:00	Biology-based approaches for mixture ecotoxicology *Tjalling Jager, Free University of Amsterdam, Netherlands*
16:00	Break
16:15	Biology-based approaches for mixture ecotoxicology *Tjalling Jager*
18:00	Round-up and open discussion on day 1-2
18:30	Walking dinner

Friday September 24, 2010

09:00	Linear and generalized linear models in R *Stefan Van Dongen, University of Antwerp, Belgium*
11:00	Break
11:15	Linear and generalized linear models in R *Stefan Van Dongen*
13:00	Lunch
14:00	Round up on day 3 and closing remarks

TASK 5: Population Models and Alternative Methods

(Tatiana Sazykina, TYPHOON, Russia)

• Reviewed existing population models to determine which ones can be adapted for assessing radiation effects on non-human biota.

• At least 8 population models were identified and can be adapted to a more generic version.

• Developed a benchmark scenario to compare the models.

• The latter required collecting life-history data for 13 reference animals (longevity of immature and mature states; growth rate; basic metabolic rate; mortality rate; birth weight; adult weight; reproductive rate).