SETAC Europe 21st Annual Meeting

15-19 May 2011, Milan, Italy

LIST OF SHORT COURSES

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SHORT COURSE 1: Linking community data and exposure for mesocosms and field investigations

Instructors:
Matthias Liess (UFZ, Germany), Mira Katwinkel (UFZ, Germany), Mikhail Beketov (UFZ, Germany)

Course length:
Half day (morning)

Course level:
Introductory

Description:
Linking community data and exposure is one of the challenging tasks of environmental risk assessment. For example when using monitoring data for post-registration studies or the interpretation of mesocosm results. The major challenges for this exercise include dealing with (i) confounding factors, (ii) differences in community composition of sample sites and mesocosm replicates and (iii) rare species. The aim of the course is twofold:
1) To inform on the relevant processes that are to be considered when linking community data and exposure.
2) To apply the knowledge obtained using a simple spreadsheet calculator, exercising with real data.
Participants will take home a profound knowledge on pitfalls and possibilities in the area of linking community data and exposure. They will also be enabled to independently calculate concentration-response relationships of complex community data.
The instructors have 20 years of experience in linking community data and exposure. They have organised the EU/SETAC workshop EPiF on effects of pesticides in the field (http://www.systemecology.eu/EPiF/Download.html), and designed the SPEAR indicator system used to identify and predict effects of pesticides in streams (http://www.systemecology.eu/SPEAR/Start.html).

Objectives:
Participants will take home a profound knowledge on pitfalls and possibilities in the area of linking community data and exposure. They will also be enabled to independently calculate concentration-response relationships of complex community data.
We especially encourage participants to bring their own data so that we can analyse them on-site. Please contact the instructors if you wish to do so.

Course outline:

08.00 - 08.15 Introduction: Effects of toxicants at community and ecosystem levels - The challenge of complexity

We will introduce the topic and major challenges including: (i) confounding factors, (ii) differences in community composition of sample sites and mesocosm replicates and (iii) rare species. The trait-based approaches will be presented, as a promising solution for these difficulties.

08.15 - 09.45 First half of material: SPEAR indices -application in mesocosm and field studies

We will present case studies:

- Field study in Germany, France, and Finland with pesticides
- Field study in Western Siberia with petrochemicals
- Mesocosm study with an insecticide thiacloprid

Participants will be presented a detailed overview on the major challenges when attempting to link community data and exposure (mesocosms and field). The relevant literature on that topic will be considered.

09.45 - 10.00 Coffee break

10.00 - 11.30 Second half of material: SPEAR Calculator - Introductory course and work with example data-sets (participants may bring their own data-sets)

The software SPEAR Calculator will be introduced, and participants will be guided trough the following topics:

SPEAR Calculator overview
How to prepare and deal with data-sets
How to analyze field data-sets
How to analyze mescosm data-sets
Example calculations

With a "hands on" experience participants will be enabled to use a calculator applying the knowledge gained on real data, provided by the instructor. The use of own data is possible as well (contact instructor beforehand to put data in a ready to use format).

11.30 - 12.00 Review, questions and course evaluation

The main features, advantages, and disadvantages of the methods presented will be summarized. Questions will be addressed.

Products / course materials:
- Detailed list of major challenges when attempting to link community data and exposure
- Detailed list of approaches to link community data and exposure
- Literature review
- Calculator to perform assessments of own data

Participants to bring their own laptop to the course:
Yes

SHORT COURSE 2: The International Reference Life Cycle Data System (ILCD) Handbook

Instructors:
Rana Pant (JRC European Commission, Italy), Marc-Andree Wolf (JRC European Commission, Italy), Serenella Sala (JRC European Commission, Italy), Miguel Brandão (JRC European Commission, Italy)

Course length:
Half day (afternoon)

Course level:
Intermediate

Description:
Life Cycle Thinking (LCT) and Life Cycle Assessment (LCA) are the scientific approaches behind modern environmental policies and business decision support related to Sustainable Consumption and Production (SCP). The International Reference Life Cycle Data System (ILCD) provides a common basis for consistent, robust and quality-assured life cycle data and studies. Such data and studies support the coherent implementation of life-cycle related SCP instruments, such as Ecolabelling, Ecodesign, Carbon footprinting, and Green Public Procurement. In this context, JRC led a "science to policy" process which resulted in the ILCD International Reference Life Cycle Data System (ILCD) Handbook. ILCD Handbook is a series of detailed technical documents, providing guidance for good practice in Life Cycle Assessment in business and government. The ILCD Handbook can moreover serve as "parent" document for developing sector- and product-specific guidance documents, criteria and simplified tools. The ILCD Handbook is based on the existing international standards on LCA, ISO 14040/44, that provide the indispensable framework for LCA. This framework, however, leaves the individual practitioner with a range of choices that can change the results and conclusions of an assessment. Further guidance is therefore needed to support consistency and quality assurance. The ILCD Handbook has been developed building on dozens of other guidance manuals from a range of actors (industry, science, consulting) and many more scientific publications. The principle target audience of the technical ILCD Handbook guidance documents themselves is the LCA practitioner as well as experts in the public and private sector dealing with environmental decision support related to products, resources, and waste management.

Objectives:
The short course aim to give an overview of the the ILCD Handbook, supporting its use in the context of LCA studies and applications. Considered manuals and other material will be named as well as an overview be given of the consultation steps and there outcome.
The following technical documents will be introduced and presented:

- General guide for Life Cycle Assessment (LCA) - Detailed guidance
- General guide for Life Cycle Assessment (LCA) - Provisions and Action Steps
- Specific guide for Life Cycle Inventory (LCI) data sets (JRC48182)
- Framework and requirements for Life Cycle Impact Assessment (LCIA) models and indicators
- Nomenclature and other conventions
- Review schemes for Life Cycle Assessment (LCA)
- Reviewer qualification for Life Cycle Inventory (LCI) data sets
- Review scope, methods and documentation
- Recommended Life Cycle Impact Assessment (LCIA) models and indicators

Course outline:

13.00 - 13.15 Introduction to the International Reference Life Cycle Data System (ILCD) scope and development process (R. Pant)
- Policy background
- Purpose, scope, target audience of the ILCD
- Development process of the ILCD

13.15 - 14.45 ILCD Handbook: structure and guidelines, compliance (M.-A. Wolf)
- Brief overview of the ILCD system and its components
- Overview of ILCD Handbook documents and their relationships
- Working with the ILCD Handbook towards "ILCD-compliant LCA studies"

14.45 - 15.00 Coffee Break

15.00 - 15.45 ILCD and Life Cycle Inventory (LCI) (M.-A. Wolf)
- Developing "ILCD-compliant LCI data sets"
- Developing LCI data sets that meet the "ILCD Data Network - entry level" requirements
- Supporting tools etc.

15.45 - 16.45 ILCD and Life Cycle Impact Assessment (LCIA) (S. Sala and M. Brandao)

- The connection LCI and LCIA
- Framework and requirements for LCIA methods
- Recommended LCIA methods and factors

16.45 - 17.00 Course evaluation (R. Pant)

Products / course materials:
The background material for the course wil be available at the JRC website.
After the course, the presentations will be available for the participants.

Participants to bring their own laptop to the course:
No

SHORT COURSE 3: Use of QSAR models for REACH: practical use of the CAESAR and US EPA T.E.S.T models

Instructors:
Elena Boriani (Mario Negri Research Institute, Italy), Todd Martin (US EPA, USA), Emilio Benfenati (Mario Negri Research Institute, Italy), Alessandra Roncaglioni (Mario Negri Research Institute, Italy)

Course length:
Half day (afternoon)

Course level:
Introductory

Description:
REACH is the new European Community Directive on chemicals and their safe use to protect human health and the environment. Existing animal test data is not sufficient to meet the needs of REACH. In order to reduce the need for additional animal testing, the REACH legislation establishes and promotes the use of alternative methods, such as quantitative structure-activity relationship (QSAR) methods. Using non-testing methods it is possible to reduce the number of animal tests and the costs of the tests. Within the CAESAR EU project (http://www.caesar-project.eu) specific in-silico models for REACH endpoints have been developed to predict the biological activity of chemicals, and further improved within other projects, such as OSIRIS, ORCHESTRA and ANTARES. A battery of new QSAR models have been also developed by US EPA (http://www.epa.gov/nrmrl/std/cppb/qsar/index.html), also in collaboration with the CAESAR initiative. This course provides a practical overview of these QSAR models. Particular attention will be also given to the issue of the applicability domain. The course will be mainly practical, and we will also address the typical errors which can occur with these methods, and how to avoid them, in order to have safer results. This course is strongly recommended to understand the meaning of QSAR model results and to critically and correctly interpret them in the context of chemical safety for REACH.

Objectives:
The course will provide examples and guidance on the practical the use of particular QSAR, for assessing chemical properties and toxicity data for REACH compounds. CAESAR and US EPA models will be tested and results will be critically discussed. The course is not aimed to teach all QSAR features but recommended practices to deal with QSAR methods in a critical way.
Participants will learn how to use QSAR models, what can be obtained and what it cannot. After the course they will be able to perform their own calculations using the user friendly, freely available CAESAR and US EPA models. They will also be able to interpret the obtained results.

Course outline:

13.00 - 13.20 Introduction to alternative methods requirements for REACH legislation

- REACH legislation
- REACH requirements
- Different possible use of QSAR for REACH (registration, classification and labelling, prioritisation)

We will introduce the approach given by the REACH legislation on the QSAR methods. The requirements for these methods are defined by REACH. We will compare the European approach with the approach used in the USA.

13.20 - 14.45 Brief introduction on the CAESAR QSAR methods

We will present the five endpoints in CAESAR:

- BCF
- Skin Sensitisation
- Mutagenicity
- Carcinogenicity
- Developmental Toxicity

We will show the results for the validation sets for these models, and how to use them.
We will introduce the tools, available within CAESAR, for the evaluation of the applicability domain.
We will address the evaluation according to the OECD principles, accuracy, sensitivity, specificity, false positives and false negatives.
Pitfalls of the QSAR methods will be shown, discussing when not to use the models, and how to take advantage of different models.
Participants will use the models themselves, though a series of different exercises.

14.45 - 15.00 Coffee break

15.00 - 16.30 We will provide an introduction on the QSAR methods in the US EPA T.E.S.T software including the model equations, the molecular descriptors used, and the model constraints (used to define the applicability domain).
We will then briefly discuss the different endpoints in T.E.S.T:

- 96 hour fathead minnow lethal toxicity (LC50)
- 48 hour Daphnia magna lethal toxicity (LC50)
- 48 hour Tetrahymena pyriformis growth inhibition (IGC50)
- Oral rat toxicity (LD50)
- Fish bioaccumulation factor
- Developmental toxicity
- AMES mutagenicity

The external validation set results for each endpoint will be presented.
Participants will use the models themselves, though a series of different exercises. The advantages and disadvantages of the different QSAR methodologies will be discussed.

16.30 - 17.00

- Comparison within experimental values /other software results
- Understanding the meaning behind a QSAR approach
- Review, questions and course evaluation

We will summarise the main lessons and the advantages and disadvantages of the methods. Questions will be addressed.

Products / course materials:
Re-prints of relevant published articles, handouts of lecture slides and other course materials including files of the calculated examples and interesting and useful links.

Participants to bring their own laptop to the course:
Yes

SHORT COURSE 4: Aquatic Toxicology in vitro: methods and applications for fish

Instructors:
Michelle Embry (ILSI Health and Environmental Sciences Institute, USA), Kristin Schirmer (Eawag, Switzerland), Katrin Tanneberger (Eawag, Switzerland), Karla Johanning (K Johanning Consultancy), Ruben Strecker (University of Heidelberg, Germany), Scott Belanger (Procter & Gamble, USA)

Course length:
Half day (afternoon)

Course level:
Introductory

Description:
This short course, sponsored by the SETAC Animal Alternatives Advisory Group (AAAG) will provide a primer on fish in vitro methodologies. Fish in vitro methodologies can offer experimental approaches and techniques not feasible or easily applied to whole fish; in particular they allow for a mechanistic understanding of physiology and toxicology on the cellular or sub-cellular level. Moreover, fish are the dominant vertebrate species for regulatory evaluation of ecotoxicity and are afforded the same legal protection as for example mammals. It is for this reason that the establishment and validation of alternatives to fish tests is an important and urgent societal goal. On this background, this course will focus on methodologies that are closely related to identification of endpoints and information commonly used in the regulatory environment. The course will broadly highlight in vitro fish methdologies and provide details on four key areas: cell lines, primary cells, subcellular fractions, and embryo tests. The course will conclude with a discussion of the current regulatory environment, advantanges and limitations, replacement / refinement of in vivo tests, and future areas of reserach focus.

Objectives:
- Provide a "primer" on available in vitro methodologies for fish
- Explore the domain of applicability of the various test methods
- Discuss data gaps and research needs
- Provide basic information on the various in vitro methodologies
- Highlight available resources

Course outline:
13.00 - 13.15 Introduction & Overview (Michelle Embry)
- Why this course, overview of the topics to be covered, placing the course in the context of 21st century toxicology, goals, etc.

13.15 - 14.00 Fish cell lines (Kristin Schirmer; Katrin Tanneberger)
- History, needs for cell culture lab
- Derivation, general culture
- Review of different available fish cell lines
- Specific test considerations for fish cell lines

14.00 - 14.45 Primary hepatocytes (Karla Johanning)
- General considerations related to isolation & use (cryopreservation, availability, application)
- Comparison with fish cell lines

14.45 - 15.00 Coffee break

15.00 - 15.30 Subcellular fractions (Karla Johanning)
- S9, microsomes, etc.
- General considerations related to preparation & use
- Application for estimation of bioaccumulation

15.30 - 16.00 Fish Embryo test (Ruben Strecker)
- Methodology & application

16.00 - 16.30 General overview for fish in vitro models (Scott Belanger)
- Applications
- Advantages and disadvantages
- Limitations
- Replacement / refinement

16.30 - 17.00 Review, questions, and course evaluation

Products / course materials:
Booklet with background reading and lecture slides

Participants to bring their own laptop to the course:
No

SHORT COURSE 5: The Endocrine System: The Good, The Bad, and The Regulations

Instructors:
Ellen Mihaich (Env. & Reg. Resources, USA), Lisa Ortego (Bayer CropScience, USA), Pat Guiney (S.C. Johnson & Son, USA)

Course length:
Half day (morning)

Course level:
Introductory

Description:
In response to the concern that certain environmental chemicals could be interfering with the endocrine system of humans and wildlife regulations have been promulgated in various regulatory bodies around the world to target the evaluation of these types of effects. The purpose of this short-course is to address key topics related to endocrine system evaluation and regulatory requirements around the world. The course will provide basic information on the vertebrate endocrine system, mechanisms of control, and adverse effects. The focus of the endocrine system presentation will be the estrogen, androgen, and thyroid systems. The requirements of the US EPA's Endocrine Disruptor Screening Program as well as those for REACH and other regulatory initiatives will be reviewed and the specific screens and tests will be discussed. Finally, a simulation game, called EndoChallenge, will be staged where small groups of participants can engage in the activities required by the Endocrine Disruptor Screening Program, many of which are OECD guideline studies, which will reinforce the use of the various screens in a global regulatory context.

Objectives:
To provide a basic knowledge of the functioning and interactions of the endocrine system in mammals, birds, and aquatic organisms, the review requirements of regulatory programs around the world including REACH and the US Endocrine Disruptor Screening Program (EDSP), and to apply the concepts discussed using an interactive simulation game based on the activities required by the US EDSP and other regulatory authorities.

Course outline:
08.00 - 08.10 Introduction and Course Objectives (Dr. Ellen Mihaich)
08.10 - 09.00 Endocrine System Pathways and Function (Dr. Pat Guiney)
- General Overview of the Endocrine System
  - Basic Anatomy
  - Hormones and Receptors
- Mechanisms of Control of the Endocrine System
- Endocrine System Disorders
- Conservation of the Endocrine System

09.00 - 09.45 The Endocrine System and Regulatory Drivers (Dr. Lisa Ortego)
- Historical Context
- Endocrine Disruptor Screening Program
  - Tier 1 Screening Battery
  - Tier 2 Tests

09.45 - 10.00 Coffee Break
10.00 - 10.30 Regulatory Drivers Continued (Dr. Ellen Mihaich)
- REACH
- Other Regulatory Drivers
- Risk Assessment Process Overview
- Weight of Evidence

10.30 - 11.45 EndoChallenge: The Game (Dr. Ellen Mihaich, Dr. Lisa Ortego, Dr. Pat Guiney)
11.45 - 12.00 Wrap-Up, Questions and Evaluation

Products / course materials:
A bound set of powerpoint slides, reference materials, and a copy of the game scenario will be provided to each participant.

Participants to bring their own laptop to the course:
No

SHORT COURSE 6: Characterisation of nanoparticles in the framework of ecotoxicological studies

Instructors:
Caterina Minelli (National Physical Laboratory, UK), Samuel Legros (University of Vienna, Austria)

Course length:
Half day (afternoon)

Course level:
Introductory-intermediate

Description:
Nanomaterials ecotoxicology is an interdisciplinary field of growing importance given the rapid rise in products which contain nanomaterials. Scientists involved in this field need to master a wide spectrum of knowledge and techniques, which often extends beyond their professional background.
Robust methodologies for the physico-chemical characterisation of nanomaterials in environmentally-relevant media is of paramount importance to understand interactions between these materials, the environments and living organisms. This course provides scientists with an overview of methodologies for the physico-chemical characterisation of nanomaterials in the framework of eco-toxicological studies. It is addressed to scientists without extensive background in this area, as well as those wishing to enlarge their knowledge of nanomaterials characterisation. This course also aims at encouraging the development of standardised robust methodologies and is therefore of interest to scientists already active in the field.
The course will be given by scientists from the UK National Physical Laboratory (NPL) and Food and Environment Research Agency (FERA). NPL is the UK's National Measurement Institute, with international reputation in the field of materials characterization. FERA is the leading UK government body for food and environment research. Both organizations lead and participate in a portfolio of European and international research projects on nanomaterials eco-toxicology.

Objectives:
This course aims at providing scientists with:
- A clear definition and understanding of the properties of nanomaterials under investigation in eco-toxicological studies. Properties include: size, size distribution, composition, aggregation, dissolution and sedimentation behaviour, concentration, surface charge and surface chemistry.
- An overview of the range of techniques available to characterise the parameters listed above.
- An overview of the best-practice methodologies utilized to prepare the samples.
- An overview of the international research activity in the field, completed by a list of references and contact details for programme managers, research institutions and companies active in this area.

Course outline:

13.00 - 13.15 Introduction and overview
- Commercial use of nanomaterials (motivations and examples of use).
- Routes of human exposure to nanomaterials and impact on environment.
- Identification of nanomaterials properties relevant to ecotoxicological studies.
- Overview of the European/international research activity in the field (OECD-funded, EU-funded projects, etc).

13.15 - 14.45 Physical and chemical characterisation of nanomaterials
- Definition of parameters to be measured.
- Overview of the techniques utilized for measuring nanoparticle size, size distribution, composition, concentration, aggregation and sedimentation behaviour, surface charge and surface area. Discussion on the use of the techniques and associated protocols for sample preparation in relation to sample nature and applications.
- Overview of surface analysis techniques utilized for assessing nanoparticle surface chemistry (e.g. X-ray photoelectron spectroscopy, time-of-flight secondary ion mass spectroscopy) and challenges associated with the study of nanometer-sized samples.

14.45 - 15.00 Coffee Break

15.00 - 16.30 Characterisation of nanoparticles in environmental matrices
- Identification of different scenarios of nanoparticles in the environment and development of standard model systems to be utilized in nano-eco-toxicology studies.
- Discussion on the effects of environmental matrices on nanomaterials fate

and properties.
- Overview of the techniques utilized to detect and characterise nanomaterials in environmental matrices (e.g. soil, water, air).
- Overview of the mechanisms of interactions of nanoparticles with the environment.

16.30 - 17.00 Review, questions and course evaluation

Products / course materials:
Course manual in agreement to SETAC guidelines.

Participants to bring their own laptop to the course:
No

SHORT COURSE 8: Marine risk assessment of chemicals and pharmaceuticals: the state-of - the-science

Instructors:
Tom Hutchinson (Centre for Environment, Fisheries and Aquaculture Science (Cefas), UK), Tony Millais (XODUS Group, UK), David Sheahan (Cefas, UK)

Course length:
Half day (afternoon)

Course level:
Introductory

Description:
It is recognised internationally that risk assessment approaches for chemicals need to consider potential impacts on marine environments. Both the European Commission report on legislation in the area of chemicals (including agrochemicals, biocides, industrial chemicals and pharmaceuticals) and the OSPAR Hazardous Substances Strategy recognise the need for marine risk assessment data. Under OSPAR, particular concerns focus on substances that are considered as Persistent, Bioaccumulative and Toxic (PBTs). Global demographic factors leading to major increases of human populations along coastlines, the rapid development of marine technologies and energy production (eg offshore energy generation) and coastal flood risks due to climate change are additional long-term challenges for marine risk assessment. Coastal aquaculture is also increasingly important as a human food source. Against this background, this introductory short course will cover the following key elements: (1) EU, North American and other international policy drivers (eg REACH, Deepwater Horizon Oil Spill) for marine risk assessment of chemicals and pharmaceuticals; (2) marine fate assessment including contaminated sediment assessments (3) marine effects assessment case studies – including the OSPAR Offshore Chemicals Notification Scheme (OCNS) for the oil and gas sector plus a pharmaceutical case study; and (4) current global challenges in marine risk assessment across Europe, North America and south-east Asia.

Objectives:
(1) To provide participants with an introduction to marine pollution issues and the need for marine risk assessments to also consider climate change and demographic impacts on coastal zones;
(2) To give a state-of-the-art review of current marine risk assessment policy drivers pertinent to agrochemicals, biocides, industrial chemicals and pharmaceuticals;
(3) To describe key case studies on the persistence and fate aspect of marine risk assessment as applied to industrial chemicals (eg OSPAR Offshore Chemicals Notification Scheme for the oil and gas sector);
(4) To share experience of marine effects assessment approaches for chemicals and pharmaceuticals, including intelligent testing strategies and optimal marine species selection.

Course outline:

13.00 - 13.15 Welcome

13.15 - 14.00 Introduction to marine contamination problems and the cumulative challenges of climate change and demographic pressures on coastal ecosystems. A brief introduction to fundamental concepts in risk assessment will be provided, followed by an overview of the key EU and other regional policy drivers pertinent to marine risk assessment *(Lead instructor - Tom Hutchinson)*;

14.00 - 15.00 Marine Fate & Persistence Assessment. This part of the short course will provide an overview of the abiotic processes (eg hydrolysis, phototransformation, etc) and biotic processes (including ready and ultimate biodegradation) pertinent to evaluating the fate of chemicals and pharmaceuticals in marine systems. Modelling tools for predicting exposure concentrations (deriving the PEC_{marine}) will be presented (eg CHARM and DREAM models as used for Offshore Chemical Notification Schemes in Europe *(Lead instructor - Tony Millais)*;

15.00 - 15.15 Coffee break

15.15 - 16.15 Bioconcentration & effects assessments for marine ecosystems. Pragmatic regulatory approaches to measuring and predicting bioconcentration values will be discussed. The principles of deterministic and probabilistic hazard assessments will be presented (deriving $PNEC_{marine}$ and $HC5_{marine}$). The pros and cons of using freshwater base set data in these assessments will be discussed alongside the growing toolbox of marine ecotoxicology test methods (eg ASTM, ICES, ISO, OECD and US EPA Standard Evaluation Procedures) and how they can be used in a targeted and efficient manner.

Brief consideration will be given to assessing effluents and other complex mixtures, together with marine sediment test methods. An marine case study of an azole fungicide will be presented *(Lead instructor - Dave Sheahan)*.

16.15 - 16.45 Open discussion (Attendees are encouraged to send questions in advance that can then be included in this discussion session)

16.45 - 17.00 Concluding remarks *(All Instructors)*

Products / course materials:

1. Course handbook including printouts of all PowerPoint presentations;
2. Electronic copies of all course material (to be emailed directly to participants);
3. List of key Internet resources to support marine risk assessments of chemicals (in course handbook).

Participants to bring their own laptop to the course:

No

SHORT COURSE 9a: Introduction to statistical methods in ecotoxicology using R

Instructors:
Christian Ritz (University of Copenhagen, Denmark), Jens C. Streibig (University of Copenhagen, Denmark)

Course length:
Half day (morning)

Course level:
Intermediate

Description:
The open source statistical environment R (http://www.r-project.org) has become the lingua franca of data analysis among statisticians and is also in widespread use in many applied sciences. Many advanced statistical and graphical/visualisation techniques are only available in R, making it an extremely powerful all-in-one alternative software to specialised commercial data analysis software currently used by many ecotoxicologists. Moreover, R encourages collaborative and reproducible research.
The focus will be on giving the participants practical experience with the software. The course material will provide an introduction to R. Moreover, analysis of variance and simple regression models (including dose-response) will be introduced through a number of case studies. Expert teachers will provide guidance and assistance throughout the course.
This course is intended to give an initial introduction to the capabilities of R (an advanced course will be held in the afternoon).

Objectives:
1) Demonstrate the capabilities of open source statistical software
2) Provide hands-on experience for a few standard data analysis (cookbook)

Target audience:
PhD students, researchers, and scientists in toxicology and environmental sciences and related areas. An elementary understanding of statistical concepts is a prerequisite. Participants are encouraged to bring their own data.

Course outline:
08.00 - 08.30 Welcome and overview.
08.30 - 09.45 Lecture: Introduction to R and its basic statistics and graphics functionality.
09.45 - 10.00 Coffee break.
10.00 - 11.00 Lecture: Descriptive statistics, visualization, one-way analysis of variance and linear regression with examples from ecotoxicology.
11.00 - 12.00 Hands-on exercises to get a feel for the software.

Products / course materials:
Hand-outs of the lecture notes and course material prepared by the instructors. Installation of a working version of the open source software R on participants' own laptops.

Participants to bring their own laptop to the course:
Yes

SHORT COURSE 9b: Advanced statistical methods in ecotoxicology using R

Instructors:
Christian Ritz (University of Copenhagen, Denmark), Jens C. Streibig (University of Copenhagen, Denmark)

Course length:
Half day (afternoon)

Course level:
Intermediate-advanced

Description:
Recently, the use of R in ecotoxicology has been increasing and R is increasingly used for analysis of more complex data structures. In fact, many advanced statistical and graphical/visualisation techniques are only available in R, making it an extremely powerful multi-purpose software also within toxicoligcal sciences. Moreover, R encourages collaborative and reproducible research.
The focus will be on providing participants with some R experience with more routine, tools, and understanding for working with R. The course will be a blend of lectures on statistical as well as R topics with examples from toxicological studies, taken from recent publications in ET&C and elsewhere. In particular, various useful extensions and modifications of standard statistical methods are revisited such as generalized linear models and transformation procedures. Also, more advanced R functionality is introduced.

Objectives:
1) Review state-of-the-art statistical methods in ecotoxicology from an R perspective.
2) Show the power of open source statistical software for analysis of toxicological studies.
3) Enable participants to use the software on their own problems (take-home software).

Target audience:
PhD students, researchers, and scientists that already have acquired some familiarity with R but wish to become proficient in using R for doing statistical analyses on their own. An elementary understanding of statistical concepts and R is a prerequisite.

Course outline:
13.00 - 13.30 Welcome and overview.
13.30 - 15.45 Lecture: Advanced statistical methods for toxicologists: generalized linear models, hormesis models and other parametric extensions, transformations and other means of handling variance heterogeneity and other departures from the standard assumptions.
15.45 - 16.00 Coffee break.
16.00 - 16.30 Lecture: More on R functionality: generic methods, defining your own functions, lattice graphics, reproducible R programming, indexing and subsetting.
16.30 - 18.00 Case studies or working on own data.

Products / course materials:
Hand-outs of the lecture notes and course material prepared by the instructors. Installation of a working version of the open source software R on participants' own laptops.

Participants to bring their own laptop to the course:
Yes

SHORT COURSE 9: Statistical methods in ecotoxicology using R

Instructors:
Christian Ritz (University of Copenhagen, Denmark), Jens C. Streibig (University of Copenhagen, Denmark)

Course length:
Full day (Short course 9a + short course 9b)

For further details see "SHORT COURSE 9a: Introduction to statistical methods in ecotoxicology using R" *and* "SHORT COURSE 9b: Advanced statistical methods in ecotoxicology using R"

SHORT COURSE 11: How to best conduct aquatic ecotoxicity tests according to the International Guidelines

Instructors:
Hans Rufli (ecotoxsolutions, Switzerland)

Course length:
Full day

Course level:
Intermediate

Description:
The course provides guidance on how to perform algae-, daphnia- and other invertebrate-, as well as fish-tests taking into account the recent changes in EU regulations, US-EPA test- and OECD technical Guidelines, and how to produce scientifically valid studies accepted by the authorities in the EU, US and Japan. Each test method, algae, daphnia and fish, is exemplified with reactions of the authorities to studies submitted showing why authorities declared that a particular study did not satisfy the guideline requirements.
The course further provides information on the philosophy of testing and its background beyond what is stated in the guidelines, on effect-concentration and time-concentration relationships, on extrapolations from results of acute to chronic tests and from laboratory test results to the environment.
Last but not least, guidance will be given on how to best interpret and report studies. A case study based on an acute fish test with a 'difficult to test substance' and examples from algae tests will not only illustrate reporting needs and deficiencies, but also how certain study designs (examples from real life) may produce misleading results, which do not represent the intrinsic toxicity of the test substance. Examples will be discussed.

Objectives:
The course provides guidance on testing methods and strategies in aquatic ecotoxicology. It provides the knowledge and skills to optimise the testing in order to avoid the production of invalid data and the repetition of studies.

Target audience:
Candidates interested in the scientific background of advanced aquatic ecotoxicological testing procedures. Basic background knowledge on aquatic ecology and ecotoxicological testing is considered necessary.

Course outline:

08.00 - 08.30	General Introduction: Introduction of participants, illustration of objectives, distribution of handouts.
08.30 - 09.15	Successful Testing of Fish including Case Studies with Reactions of the Authorities: Guidance on how to perform the tests, optimal conditions for test organisms, how to produce scientifically valid studies accepted by the authorities in the EU, US and Japan.
09.15 - 09.45	Successful Testing of Daphnia (incl. other invertebrates) and Algae: Guidance on how to perform the tests, optimal conditions for test organisms, how to produce scientifically valid studies accepted by the authorities in the EU, US and Japan.
09.45 - 10.00	*Coffee break*
10.00 - 10.30	Successful Testing of Daphnia and Algae continued
10.30 - 12.00	Case Studies of Daphnia and Algae Tests: Reactions of the authorities to specific studies.
12.00 - 13.00	*Lunch*
13.00 - 14.45	Parameters affecting Toxicity: Effects of concentration, period of exposure, sensitivity of endpoints and life stages of fish on the toxicity, acute to chronic ratios.
14.45 - 15.00	*Coffee break*
15.00 - 16.45	Data Reporting: Guidance on a scientifically meaningful expression of toxicity data, examples of reported data based on study designs producing misleading results, list of questions on reporting to be discussed.
16.45 - 17.00	Review & questions
17.00 - 17.15	Course evaluation

Products / course materials:
Files with handouts

Participants to bring their own laptop to the course:
No

SHORT COURSE 14: Bayesian statistical methods in ecotoxicology

Instructors:
David Fox (Australian Centre for Environmetrics, Australia), Elise Billoir (LBBE, France)

Course length:
Full day (08.00 - 17.00 hrs)

Course level:
Intermediate

Description:
The Species Densitivity Distribution (SSD) is a cornerstone of modern ecotoxicology and provides a basis for establishing guidelines, trigger values, and limits on concentrations of hazardous chemicals in animals and the receiving environment. Experimental dose-response data are used to infer a concentration that, it is claimed, will protect some arbitrarily high fraction of all species in an ecosystem. While the technique is regarded by most as a significant improvement on the use of assessment factor, it is not without its problems and limitations. One of the most severe shortcomings is its reliance on the largely discredited NOEC. In a recent paper, Fox (2009) describes an aternative Bayesian method for the estimation of no effect concentrations and the hazardous concentrations.
This short course intend to introduce and equip participants with the basic skills necessary to analyse ecotoxicological data within a newly-developed Bayesian framework. The course material will consist of introductory lectures on basic concepts behind Bayesian inference with distinguishing points with conventional (frequentist) statistics explained, and case-studies based on real applications. Participants will be shown how to set up dose-response models, define prior distributions for the model parameters, run Bayesian inference and incorporate the resulting uncertainty to in the derivation of a more realistic hazardous concentration.

Objectives:
On completion of this course, participants will:

- have been introduced to basic probabilistic concepts unerpinning Bayesian statistics;
- be able to set up and run programs in OpenBUGS or rjags (TBA)
- be able to use Bayesian methods to fit and evaluate various models for concentration-response data
- be able to use posterior distributions for NECs to investigate uncertainty in HCx values derived from an SSD

Course outline:

08.00 - 09.00	Introductory presentation on statistical ecotox covering some of the issues with C-R modeling, ANOVA, multiple comparison techniques, NOECs, NECs, and Bayesian alternatives
09.00 - 09.45	Introduction to conditional probability, Baye's rule, prior and posterior probability distributions
09.45 - 10.00	*Coffee Break*
10.00 - 11.30	Introduction to MCMC/Gibbs Sampling to obtain an empirical posterior distribution of parameters of interest
11.30 - 12.00	A first look at the WinBUGS / OpenBUGS software
12.00 - 13.00	*Lunch break*
13.00 - 13.45	Setting up and analysing C-R model in Bayesian framework
13.45 - 14.45	Practical exercises using actual data
14.45 - 15.00	*Coffee Break*
15.00 - 16.15	Practical exercises using actual data (continuation)
16.15 - 16.45	Using the model output: sampling from the posterior distributions to obtain an estimate (with uncertainty) of an HCx
16.45 - 17.00	Course evaluation

Products / course materials:
Comprehensive course notes and electronic resources.

Participants to bring their own laptop to the course:
Yes. It is essential that participants have both the R statistical software package and the OpenBUGS software pre-installed on their computers. The links to these free programs are: R: http://www.r-project.org/ and OpenBUGS: http://openbugs.info/w/Downloads.

SHORT COURSE 18: Population models for ecological risk assessment: introduction to the documentation framework TRACE

Instructors:
Volker Grimm (Helmholtz Centre for Environmental Research - UFZ, Germany), Jürgen Groeneveld (Helmholtz Centre for Environmental Research - UFZ, Germany), Nika Galic (Alterra, Wageningen University and Research Center, The Netherlands), Pernille Thorbek (Environmental Safety, Syngenta, UK)

Course length:
Full day (08.00 - 17.30 hrs)

Course level:
Introductory

Description:
Population and other mechanistic effect models hold great potential for supporting ecological risk assessment of chemicals, in particular pesticides. Generally, current modelling practice, however, is not transparent and documentations of model assumptions, data, tests, and analyses are usually incomplete or incomprehensive for non-specialists. Modellers often do not understand the requirements of models in specific decision contexts, and decision makers often have no training in modelling. To overcome these challenges, the joint European project CREAM (http://cream-itn.eu) is applying and testing a general framework for TRAnsparent and Comprehensive documentation of Ecological models (TRACE) covering the entire modelling process. Modellers can use this framework to improve the documentation of their model structure, testing, assumptions, including organizing their "modelling notebook"; decision makers can use it as a checklist and for a systematic evaluation of models and their results. In order to evaluate a TRACE documentation, no expertise in modelling is necessary. The course will: introduce the scope and methods of modelling; demonstrate the role of model documentation; introduce the TRACE documentation framework; explain the need for Good Modelling Practice; explain how a general documentation framework can foster the establishment of Good Modelling Practice; provide examples; include short exercises in model analysis and modelling documentation, and in using TRACE documents.

Objectives:
- Introduce into the scope and methods of population models
- Demonstrate structure and analysis of example models in exercises
- Introduce the rationale of the TRACE documentation framework
- Demonstrate how TRACE documents are compiled
- Introduce into elements of Good Modelling Pratice
- Demonstrate how to read and evaluate TRACE documents

Course outline:

08.00 - 08.10 Introduction and course overview (V Grimm)

08.10 - 08.40 General introduction to ecological modelling (and mechanistic effect models in general) for risk assessment of chemicals (V Grimm)
- Definition of models, purpose of models, general examples
- The modelling cycle, demonstration of simple example model
- Type of models in population ecology (calculus, matrix, individual-based)

08.40 - 09.00 Potential and challenges of models for risk assessment of chemicals (N Galic)

09.00 - 09.45 Introduction of example models (J Groeneveld)
- The two example models that will be used in the exercises are introduced. They are both individual-based and implemented using the free software platform NetLogo. They will be sent to the participants before the course.
- Participants need to have NetLogo installed on the laptops. NetLogo is a widely used free software platform for implementing individual-based models (http://ccl.northwestern.edu/netlogo/); download and installation is easy and takes about 10 minutes. Participants will be instructed before the course on how to get and install NetLogo.
- Example model 1: Daphnia population model based on Dynamic Energy Budget theory (Martin et al., submitted). This model is spatially implicit and based on specific data.
- Example model 2: Generic model of collembolan Folsomia candida in heterogeneous environment (Meli et al., in prep.). This model is spatially explicit, but generic and designed to provide general insights. For model descriptions, the standard format ODD (Overview, Design concepts, Details) will be used.

- Participants will be asked to start NetLogo, to open the models, and to get acquainted with using them by following instructions of the lecturer.

09.45 - 10.00 *Coffee Break*

10.00 - 11.30 Exercise 1: Parameterizing and analysing the example model (simulation experiments, sensitivity analysis, explore population-level effects of pulse and chronic exposure, explore sub-lethal effects) (Grimm, Galic, Groeneveld, Thorbek)

- Participants are supposed to work in groups of two. They can choose which of the two example models they want to work on.
- Participants will be given written instructions for exercises, which start with simple variations of parameters on the user interface of the NetLogo programs and observing and describing the resulting population dynamics, to more complex tasks, including simulation experiments to test alternative sub models, sensitivity experiments where single parameters are varied, sensitivity analyses, and experiments exploring the effect of toxicants.
- Participants will be asked to keeping notes of what they are doing during the exercises.
- Exercises will be a mixture of „short-leashed" parts, where participants more or less follow the written instructions, and more demanding tasks where a (simple) question is posed and hints for how to answer it are given, but participants have to come up with their own solution and conclusions.
- The purpose of this block is to demonstrate that it is possible to understand a model, even if you are not a modeller, and to get first-hand experience in performing simulation experiments to obtain insights from a model. Another purpose is to demonstrate that even within only 1.5 hours of model analysis, you easily get so much simulated data that without a proper documentation framework it can be hard to keep track of what has been done and learned.
- After 45 minutes, 5 minutes will be devoted to discuss general technical problems or questions of understanding that might have come up. During the exercises, the three instructors will be be around and assist. (This point applies also to exercises 2 and 3.)

11.30 - 12.00 Introduction of documentation framework TRACE and its rationale (P Thorbek)

- The TRACE documentation framework, which is based on the tasks of the modelling cycle, will be introduced; a recent publication on TRACE and a TRACE User Manual will be sent to participants beforehand.
- The key ideas of TRACE – standardization of document structure and terminology, use of keeping modelling notebooks, checklist for modellers and risk assessors – will be explained.

12.00 - 13.00 *Lunch*

13.00 - 14.30 Exercise 2: Writing parts of a TRACE documentation (based on results of Exercise 1) (Grimm, Galic, Groeneveld, Thorbek)

- Participants will be given (electronic) templates of the TRACE documentation framework, and a TRACE user manual. They will be asked to put the notes they made during exercise 1 into this framework. They will also have the chance to run further simulation experiments.
- Modellers among the participants will learn the benefits of using a modelling notebook that follows TRACE terminology and structure.
- Model users will learn how modelling notebooks and TRACE documentations are compiled and how even complex and complicated models are analysed and tested in controlled simulation experiments that can be understood and assessed.
- Participants will also note that TRACE serves as a checklist of things that need to be done if a model is to be used to support decision making. Some exercises will require that participants go back to their computers and run a few further simulation experiments.

14.30 - 14.45 How to use TRACE documentations (V Grimm)

- This lecture will explain how modellers use modelling notebooks based on the TRACE format to keep track of, and organize, their testing and analys-ing of a model. It will also introduce how model users (e.g., risk assessors, decision makers) should use TRACE documentations to evaluate a model based ecological risk assessment of a chemical.

14.45 - 15.00 *Coffee Break*

15.15 - 16.45 Exercise 3: Reading and evaluating several (short) TRACE documentations (Grimm, Galic, Groeneveld, Thorbek)

- Participants will be given (short) complete and partial TRACE complete documentations, which are on other models than those used in the course.

Instructions will be given for how to scan these documentations. Specific questions will be formulated. The documentations will on purpose contain some elements which are suboptimal, incomplete, or even missing.

- The purpose of this exercise is to demonstrate how model users, who do not necessarily have a background in modelling (or computer science and mathematics), can use TRACE documentations to decide whether or not they are going to take a model-based risk assessment into account. It will also be demonstrated how TRACE helps asking specific questions to the modeller, if certain points are still unclear or not convincing.

16.45 - 17.00 From documentations to Good Modelling Practice (V Grimm)
17.00 - 17.30 Wrap-up and general discussion

Products / course materials:
All presentations, materials for the exercises, a user manual for using the documenta-tion framework, and example applications of the framework will be distributed both as hard copies and via the internet (download site, before the course).

Participants to bring their own laptop to the course:
Yes

SHORT COURSE 19: Current registration requirements for ecological risk assessment of crop protection products in the EU and India

Instructors:
Anne Alix (DGAL, France), Theo Brock (Alterra, Wageningen UR, The Netherlands), Mark Clook (NN; CRD, UK), Peter Dohmen (BASF SE, Germany), Bernhard Gottesbueren (BASF SE, Germany), Robert Luttik (RIVM, The Netherlands), Vipin Saini (Pesticide Regulatory Affairs, India), Franz Streissl (EFSA, Italy), Martin Streloke (BVL, Germany)

Course length:
Full day (08.45 - 17.00 hrs)

Course level:
Intermediate-advanced

Description:
This short course will give participants an update on the current European (EU) registration requirements in the field of ecotoxicological risk assessment. It will outline the standard studies necessary for registration as well as how risk assessments are conducted within the various fields of ecotoxicology. The day will be based around the New Regulation (1107/2009) and respective guidance documents. Accordingly, all the different areas - bird and mammals, aquatic, bees, non-target arthropods, soil, non-target plants – will be covered. Standard requirements and also higher tier testing will be addressed. The course will include the Indian perspective of Pesticide Registration and its ecological risk assessment under the Insecticides Act, 1968 and Rules 1971.
The short course will be presented by a number of experts (from authorities, academia and industry) in the area of pesticide regulation and risk assessment.

Objectives:
This course is targeted to all those who need an introduction and a most current update in the area of pesticide risk assessment, regulatory requirements and risk management.

Target audience:
All those involved or interested in pesticide regulatory and safety issues. Delegates from consultancies, industry and regulatory authorities are welcome as are scientists, students or representatives from NGOs interested or working in the area of pesticide risk evaluation.

Course outline:
Preliminary program (may require final adjustments)
08.45 Introduction (Peter Dohmen)
09.00 The Indian perspective of Pesticide Registration and its ecological risk assessment (Vipin Saini)
09.45 *COFFEE*
10.00 EFSA's role in pesticide risk assessment (Franz Streissl)
10.45 Introduction to exposure assessment (Bernhard Gottesbueren)
11.30 Aquatic study requirements and risk assessment (Theo Brock)
12.15 *LUNCH*
13.15 Bird and mammal risk assessment (Robert Luttik)
14.00 Risk assessment to bees and other terrestrial Non-target Arthropods (Anne Alix)
14.45 *COFFEE*
15.00 Soil testing and risk assessment (Mark Clook, NN)
15.45 Risk management (Martin Streloke)
16.30 Open questions, course evaluation
17.00 CLOSE

Participants to bring their own laptop to the course:
No

SHORT COURSE 20: Ecological Risk Assessment and Management - Processes and Applications

Instructors:
Bridgette DeShields (ARCADIS, USA), Timothy Iannuzzi (ARCADIS, USA), Ellen Mihaich (And Duke Universit, USA)

Course length:
Full day (08.00 - 17.00 hrs)

Course level:
Introductory - Intermediate

Description:
This course will provide a broad introduction into the science and practice of Ecological Risk Assessment (ERA), and will utilize case study examples to generate participant-instructor discussion on the practice of weight-of-evidence ERA, and the principles of risk management. While the focus will be primarily on chemical contaminants, a broad array of multi-stressor issues will also be covered. This good is suitable for participants with little or no experience in ERA, as well as those with a moderate level of understanding.
The course will be broken down into two modules. The first will cover a broad overview of the ERA process/frameworks and a concise introduction to several scientific principles and disciplines that are key to practicioners, including basic systems ecology, toxicology, population biology, fate and transport, empirical and applied modeling, data collection (design and data quality objectives), and regulatory policy and guidelines. Materials will be provided to the course participants for suggested follow-up study in each of these technical area. These will include lists of suggested readings(including a focused list of SETAC publications on the subject matter) and internet sites, terminology/definition sheets, and a computer "thumb drive" that contains electronic versions of key ERA regulations, guidance documents, and related materials.
The second module will focus on application of the ERA process to current environmental issues around the world. Case studies will be used to frame discussion on the broad application of the ERA framework to environmental issues, and risk management decision-making, te overall goal being to demonstrate how the ERA process/framework can be used to evaluate a broad array of environmental issues from localized contaminated sites to large-scale issues such as climate change.

Objectives:
1. Provide an introduction to the Ecological Risk Assessment (ERA) process and frameworks.
2. Provide a broad overview of key technical topics that are important to ERA practitioners.
3. Generate discussion between the participants and instructors on case examples and issues related to ERA process and its application to present environmental issues.
4. Provide handouts and resource lists for participants to continue learning about the key technical and regulatory topics that are covered in the course.

Course outline:
Module 1: 08.00 to 10.00 hrs
(1) Introduction to Course/Concepts of Risk Assessment
(2) Ecological Risk Assessment Approaches/Applications
(3) Sources of Risk in the Environment: Human & Ecological
(4) Basic Systems Ecology Principles
Morning Break: 10.00 to 10.15
Module 2: 10.15 to 12.00 hrs
(5) Ecological Risk Assessment: Framework, Process & Terminology
(6) Problem Formulation & Conceptual Models
(7) Exposure Assessment
(8) Effects Assessment & Introduction to Environmental Toxicology
Lunch 12.00 to 13.00 hrs
Module 3: 13.00 to 15.00 hrs
(9) Risk Characterization /Weight-of-evidence
(10) Uncertainty Assessment
(11) Environmental data: analytical toold, sampling design and data quality objectives
(12) Risk Management
Afternoon Break: 15.00 to 15.15
Module 4: 15.15 to 17.00 hrs
(13) Case Studies & Risk Assessment Process Application: EcoChallenge
(14) The Future of Ecological Risk Assessment and Bridges to Other Programs

Products / course materials:

1. MS Power Point presentation materials and handouts of selected regulatory and technical materials will be used to teach this course and generate topical discussions on current environmental issues where Ecological Risk Assessment is applicable as an assessment tool.
2. Binders of all presentation materials will be presented to the course attendees that contain areas for taking notes.
3. Computer "thumb drives"of the course materials, as well as key regulations and technical support materials will be given to each participant.

Participants to bring their own laptop to the course:
No