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SCIENCE ACROSS BRIDGES,  
BORDERS AND BOUNDARIES  
**ABSTRACT BOOK**

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SETAC Europe  
24th Annual Meeting  
Basel, Switzerland,  
11-15 May 2014  
[basel.setac.org](http://basel.setac.org)

## ABSTRACT BOOK

### SETAC Europe 24th Annual Meeting

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This book composes the abstracts of the presentations for the platform and poster sessions of the 24th Annual Meeting of the Society of Environmental Toxicology and Chemistry (SETAC), conducted at the Congress Centre Basel, MCH Messe Schweiz (Basel) AG, in Basel, Switzerland from 11-15 May 2014.

The abstracts are reproduced as accepted by the scientific committee of the meeting and appear in order of abstract code, in alphabetical order per presentation type. The poster spotlight abstracts and poster corners abstracts are included in the list of poster abstracts. The presenting author of each abstract is underlined.



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## Keynote Abstracts

### **Persistent Organic Pollutants in Switzerland and globally: problems solved?** Martin Scheringer

Persistent Organic Pollutants (POPs) have been a topic of environmental chemistry and toxicology since the 1960s. This year, we celebrate the 10th anniversary of the Stockholm Convention on POPs. Why should POPs, after so many years, still be a research priority within SETAC? First, POPs still cause serious environmental impacts and will continue to do so. Emission sources of POPs are active in many countries and need to be identified and eliminated. The global distribution and long-term fate of POPs poses many open questions; it is currently not known if and under what conditions the environmental reservoirs of POPs may be relevant as secondary emission sources. Moreover, the total number of POPs that need global action is unknown; there might be (many) more than the 23 POPs currently covered by the Stockholm Convention - but which ones? Finally, how can we determine whether the Stockholm Convention is effective? Does our POPs monitoring have sufficient spatial and temporal coverage?

*About Martin Scheringer*  
*Martin Scheringer works with the Swiss Federal Institute of Technology (ETH) in Zürich, Switzerland. His field of research is hazard and risk assessment for chemicals with a focus on environmental exposure assessment. Martin Scheringer has developed a suite of multi-media mass-balance models for analyzing the environmental fate of chemicals on various scales from local to global. Key areas of his work are the persistence and long-range transport of chemicals in the environment and the assessment of chemical property data for hazard assessment under REACH. In addition to his research, Martin Scheringer has worked extensively on the science-policy interface. He has conducted several projects with UNEP and is a co-author of a chapter on Chemicals and Waste in UNEP's 5th Global Environment Outlook and a chapter on Minimizing Chemical Risks in UNEP's Year Book 2013. Martin Scheringer is a founding member and currently the chair of the International Panel on Chemical Pollution, IPCC.*

### **Epigenetics in Environmental Toxicology and Chemistry** Juliette Legler

How is possible that exposure to a chemical during development affects a tissue in a way that its function is changed long after the exposure has stopped? How do chemicals program an organism during development, making it more susceptible to diseases later in life? If we are to understand this we must dig down into the very basics of life and how genes work. The central dogma that genes flow in a linear fashion from DNA sequence to messenger RNA to protein is clearly too simplistic. One area of molecular biology where new discoveries are made at an astonishing rate is the field of epigenetics. Epigenetics describes the array of chemical markers and switches that lie along DNA providing instructions to genes for what to do, and where and when to do it. Newfound insights in this field will help us understand how chemicals may alter basic processes in development at levels that may not produce overt toxicity. It is an exciting time in molecular and evolutionary biology, and role of epigenetics in toxicity is the challenge than now lies with us as environmental toxicologists and chemists.

*About Juliette Legler*  
*Juliette Legler is a Professor of Toxicology and Environmental Health at the Institute for Environmental Studies of the VU University Amsterdam. With a background in environmental toxicology and molecular biology, she has developed test methods to identify the effects of endocrine disrupting chemicals. Her research with zebrafish and in vitro models has expanded to understanding the effects and underlying mechanisms of chemical exposure during development in both fish and in humans. As coordinator of the EU project OBELIX and recipient of a Netherlands Organization for Scientific Research VIDI grant, she is examining the role of chemical exposure in the developmental origins of health and disease. Legler also coordinates the VU's Master program in Environmental Chemistry and Toxicology and has served on various advisory and review boards, including the Dutch Health Council and OECD.*

### **Sufficiency: Enough but Not Too Much** Thomas Princen

Growth. Efficiency. Consumer sovereignty. These principles served the 20th century well. Resources were abundant, waste sinks vast, demand unyielding. But this is the 21st century. We need to figure how to live within the regenerative capacities of biophysical and social systems. We need to put a brake on endless expansion and consumption. For that, new principles are needed to guide human

organization onto a sustainable path. Among them are sufficiency: living well now and into the future by living on less than the most possible now. Thomas Princen will develop the notion of sufficiency grounding it at three levels of behavior—the individual, the organizational, and the societal. He will argue that sufficiency is but one element in a broader “politics of urgent transition.

*About Thomas Princen*  
*Thomas Princen explores issues of social and ecological sustainability at the School of Natural Resources and Environment at the University of Michigan. He works on principles for sustainability (e.g., sufficiency), overconsumption, the language and ethics of resource use, and the transition out of fossil fuels. Princen is the author of Treading Softly: Paths to Ecological Order (2010/2013), author of The Logic of Sufficiency (2005), and lead editor of Confronting Consumption (2002), all three published by MIT Press. The last two were awarded the International Studies Association's Harold and Margaret Sprout Award for the “best book in the study of international environmental problems.” He is co-editor of The Localization Reader: Adapting to the Coming Downshift (MIT Press, 2012), co-author of Environmental NGOs in World Politics: Linking the Local and the Global (Routledge, 1994) and author of Intermediaries in International Conflict (Princeton University Press, 1992/1995). Princen is currently working on three book-length projects: \*Ending the Fossil Fuel: Keep Them in the Ground (contract, MIT Press). \*Distant Horizons: An Ethic of the Long Term \*The Politics of Urgent Transition He was recently awarded a writing fellowship at the Rachel Carson Center in Munich. Before that he was named an Aldo Leopold Leadership Fellow, sponsored by the Packard Foundation, and before that was a Pew Faculty Fellow for International Affairs. Princen received his Ph.D. in Political Economy and Government from Harvard University in 1988 and a Bachelor of Arts in biology from Pomona College in 1975. He was a MacArthur Foundation Post-Doctoral Visiting Research Fellow in International Peace and Security at Princeton University from 1988 to 1989. He serves as Faculty Associate, Program in the Environment; Faculty Affiliate, Erb Institute for Global Sustainable Enterprise; Co-Director, Workshop on Urgent Transitions; and Associate Professor of Natural Resource and Environmental Policy; all at the University of Michigan.*

## SOCIETY OF ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY

In the 1970s, no forum existed for interdisciplinary communication among environmental scientists—biologists, chemists, toxicologists—as well as managers and engineers others interested in environmental issues.. The Society of Environmental Toxicology and Chemistry (SETAC) was founded in North America in 1979 to fill the void. Based on the dynamic growth in the Society’s membership, meeting attendance and publications, the forum was clearly needed. SETAC has two administrative offices, in Pensacola, Florida, USA, established in 1990, and in Brussels, Belgium, established in 2003.

A unique strength of SETAC is its commitment to balance the scientific interests of government, academia and business. The Society by-laws mandate equal representation from these three sectors for officers, World Council, Geographic Unit Boards of Directors and Councils, and Committee members and governance of activities. The proportion of members from each of the three sectors has remained nearly equal over the years.

SETAC publishes two globally esteemed scientific journals and convenes annual meetings around the world, showcasing cutting-edge science in poster and platform presentations. Because of its multidisciplinary approach, the scope of the science of SETAC is broader in concept and application than that of many other societies.

The Society is concerned about global environmental issues. Its members are committed to Environmental Quality through Science®, to timely and effective communication of research, and to interactions among professionals so that enhanced knowledge and increased personal exchanges occur. SETAC’s growth has been marked the establishment of geographic units around the world: SETAC Europe in 1989, SETAC Asia/Pacific in 1997, SETAC Latin America in 1999 and SETAC Africa in 2012. As evidence of international acceptance of the SETAC model and of the great interest at the local level, regional chapters of the geographic units are being considered for a number of countries.

### Publications

Environmental Toxicology and Chemistry, an internationally acclaimed scientific journal, has grown from a quarterly publication of fewer than 400 pages annually in 1980 to a monthly publication of nearly 3,000 pages annually.

Integrated Environmental Assessment and Management, launched in 2005 to bridge the gap between scientific research and its application in environmental decision-making, regulation and management, has become a well-respected quarterly publication of 700 pages annually.

SETAC Books total more than 100, encompassing workshop results and other scientific studies.

## Platform Abstracts

### Ecotoxicology in tropical and polar regions (I)

#### 1 **The Laguna Madre de Dios, a Costa Rican tropical coastal lagoon ecosystem at risk**

**L.E. Castillo**, Universidad Nacional Costa Rica / IRET; C. Ruepert, Universidad Nacional / IRET; F. Ramirez, Universidad Nacional / Central American Institute for the study of toxic substances IRET; G. Moraga, D. Ballesterro, C. Brenes, S. Vargas, R. Benavides, Universidad Nacional; F. Mena Torres, Universidad Nacional / IRET; M. Arias, Universidad Nacional; J. Gunnarsson, Stockholm University / Department of Ecology Environment and Plant Sciences DEEP  
The Laguna Madre de Dios is a coastal lagoon located in the Caribbean watershed of Costa Rica. The lagoon has great ecological value but is submitted to anthropogenic stress mainly because of an intensive use of fertilizers and pesticides in the banana, rice and pineapple plantations located upstream. The study presented here is part of a broader study on pesticide risk assessment that includes pesticide runoff, a toxicity assessment of pesticides used in plantations in the area of the RMD Basin; an *in situ* toxicity and ecological assessment of pesticide run-off and the application of the PERPEST and TRIAD methodology. Land and pesticide use studies were carried out using GIS. Pesticide use information was collected through interviews. An hydrological and bathymetric study were carried out at the lagoon in dry and rainy weather.. Sampling sites for pesticide residues and nutrient analysis were selected to cover canals and creeks that flow into the River Madre de Dios (RMD) collecting runoff from the agricultural areas. The main pesticides found in the area include insecticides/nematicides, herbicides and fungicides (amethrine, chlorpyrifos, chlorothalonil, diazinon, diuron, epoxiconazole, ethoprophos, hexazinone and pirimetanil) in concentrations frequently higher than the Water Quality Criteria for the protection of aquatic organisms. Twenty three marine, estuarine and freshwater fish species were identified during one sampling occasion in the lagoon in 2012. Reports of 18 fish kills have been documented in the area for the years 2007-2009, several insecticides and difenoconazole were present in the samples analyzed, reported in the area per year between 2007-2012. The analysis of several fish kills reported during 2013 show the presence of 5-6 pesticides present in those samples including organophosphates such as terbufos and fenamifos as well as diazinon, which are highly toxic compounds. The frequent occurrence of pesticides in the lagoon in concentrations over the criteria for the protection of aquatic organisms points out the risk of ecological damage to this ecosystem as is confirmed by the fish mortalities occurrig in the area.

#### 2 **TIER I Toxicity assessment of pesticides used in banana and pineapple plantations detected on the Río Madre de Dios watershed, Costa Rica**

**M. Arias**, F. Mena-Torres, R. Ugalde, Universidad Nacional; R. Ramo, Stockholm University; L. Grandas, Universidad Nacional; C. Ruepert, Universidad Nacional / IRET; L. Castillo, Universidad Nacional; P. van den Brink, AlterraWageningen UR / Aquatic Ecology and Water Quality Management Group b Alterra; J. Gunnarsson, Stockholm University / Department of Ecology Environment and Plant Sciences DEEP

Pesticide runoff in developing countries of tropical regions pose high risks to aquatic ecosystems, due to poor agricultural practices and the use of highly toxic compounds. Costa Rica is among the countries that import higher amounts of agricultural pesticides and environmental toxicity to aquatic ecosystems have long been a concern for communities near intensive areas of banana and pineapple production. The Río Madre de Dios (RMD) watershed in the Caribbean lowlands is one of the aquatic ecosystems in the Caribbean area where extensive banana and pineapple plantations exist. This ecosystem has been the focus of attention for several years now as a consequence of fish kills reported with a certain frequency and potentially associated with pesticide runoff. The purpose of this work was to perform a first tier assessment of the toxicity risks of the maximum pesticide concentrations (MEC) found at RMD, by using acute toxicity hazard concentrations for 5% of the species (HC5) and native species toxicity values. Risk Quotients (MEC/HC5≥1.00) were found for the insecticides carbofuran, chlorpyrifos, diazinon, ethoprophos, carbaryl and terbufos and for the herbicide diuron. Toxicity values (LC50-96hrs) for *Parachromis dovii* (fish) were 242 (179-328 95%CI) µg/L for ethoprophos, 202 (140-242 95%CI) µg/L for carbofuran and 117 (87-158 95%CI) µg/L for chlorpyrifos. In the case of crustaceans, for *Daphnia ambigua* aEC50-48hrs values of 1.1 µg/L (± 0.8, SD), 0.3µg/L (±0.2, SD) and 0.14 (± 0.001, SD) were found for carbofuran, diazinon and chlorpyrifos respectively. Meanwhile, for *Macrobrachium* sp. values of 20 µg/L (12 – 3395%CI), 23.8µg/L (13.4 - 35,895%CI) and 24µg/L (15 – 3895%CI) were found for ethoprophos, carbofuran and diazinon. Finally, the acute toxicity (EC-7d) of diuron to *Lemma* sp. was found to be 31µg/L (±12, SD) and 16µg/L(±3.2, SD) based on reproduction and dry weight measurements.According to acute environmental quality criteria

derived from ecotoxicological databases and from the sensitivity of native species measured in the lab, the pesticide concentrations in the RMD basin can have toxic effects on aquatic biota. An ecotoxicological evaluation is the next step to corroborate if the toxicity potential seen can be measured in the field, and if other impairments on community structure and/or function can be detected. **<strong>n**

#### 3 **Integrated ecological risk assessment of pesticide run-off using the TRIAD weight-of evidence approach: a case study in the Río Madre de Dios River, Costa Rica**

**J. Gunnarsson**, Stockholm University / Department of Ecology Envionment and Plant Sciences DEEP; M. Arias, Universidad Nacional; F. Mena Torres, Universidad Nacional / IRET; S. Echeverria Saenz, Universidad Nacional / Instituto Regional de Estudios en Sustancias Toxicas IRET; C. Ruepert, Universidad Nacional / IRET; P. van den Brink, AlterraWageningen UR / Aquatic Ecology and Water Quality Management Group b Alterra; M. Tedengren, Department of Ecology Environment and Plant Sciences DEEP; L. Castillo, Universidad Nacional  
The “TRIAD” an ecological risk assessment (ERA) tool based on the combined weight of evidence (WoE) from several lines of evidence (LoE) was used in order to assess the ecological risks from pesticide contamination in the Río Madre de Dios (RMD), a watershed that drains water from banana and pineapple plantations in the Caribbean lowlands of Costa Rica. The TRIAD is a tiered ERA method, where contamination risks are assessed based on the integration of data from three independent LoE from: 1) chemistry, 2) toxicology, 3) ecology. Within a research project called “TROPICA” (Tiered Risk Assessment of Pesticide Use in Costa Rican Agriculture) chemical, toxicological, and ecological measurements were carried out ca 2-3 times a year in the Río Madre de Dios, a river system that receives drainage water from banana and pineapple plantations. In two companion studies of the TROPICA project, TIER 1 and TIER 2 ERA analyses were done using toxicity testing in the laboratory and *in situ* respectively, in order to assess the risks from pesticide contamination in the RMD watershed. In this study we gathered all chemical, toxicological and ecological data from these two studies over a sampling period of 3-4 years, scaled all the data from 0-1 values, where 0 corresponds to the minimum and 1 to the maximum risk values, using various scaling techniques. Then the scaled data from the three independent LoE were integrated using geometric means and contamination risk values and their standard deviations were calculated for each sampling season and for the total project duration. Our results show that the RMD river is at high chemical risks from both pesticides (0.7) and nutrients (PO<sub>4</sub>) (0.6 - 0.7), that the toxicity risk to aquatic organisms is low (0.1 - 0.2) (based on biomarker and toxicity tests), and that the ecological risks to benthic invertebrates is relatively high (0.5 – 0.7), but not due to pesticide concentrations but rather due o low oxygen levels and eutrophication. Overall the integrated contamination risk to native aquatic organisms in the RMD was moderate (0.4) to high (0.6) indicating that mitigation measures are imperative and urgently needed in order to protect the native wildlife from pesticide and nutrient contamination.

#### 4 **Integrated Ecological Risk Assessment (ERA) of aquaculture and anthropogenic pollution in the Phu Long commune, Hai Phong city, Vietnam**

**P. Bruce**, Stockholm University / Department of Ecology Environment and Plant Sciences DEEP; V. Le, Stockholm University / Ecology Environment and Plant Sciences; H. Than Thi, MCD Vietnam; L. Nguyen Thi Tuyet, HACEM; J. Gunnarsson, Stockholm University / Department of Ecology Environment and Plant Sciences DEEP

With increased globalization, climate change, high development rates and a growing population several Southeast Asian countries, such as Vietnam, face increasing environmental threats with a following need for preventive and remediation strategies. For the first time in Vietnam, we have applied an adapted version of the TRIAD, an ecological risk assessment (ERA) tool based on the combined weight of evidence (WoE) from several lines of evidence (LoE) and tiered approach ensuring an effective use of resources in order to assess the risks from anthropogenic pollution on the marine environment off Cat Ba island Biosphere Reserve. In a TRIAD data from different LoE were collected and then scaled from 0-1. Integrated risk values were then determined to provide evidence based management options. In the present study the TRIAD method was modified in order to also include socio-economical data, gathered from interview studies Physico-chemical measurements (nutrients, contaminants, O<sub>2</sub>, suspended solids) together with ecological/biological measurements (community structure of phyto-, zooplankton and benthic fauna) were gathered from three different coastal sites with various aquaculture pressures, and integrated with the TRIAD to interview data from the local population.The results show medium to high risk for several physico-chemical properties and concentrations such as heavy metals, nitrogen and coliforms. The ecological LoE shows low to medium risks for zoobenthic- and plankton communities and abundance and high risk for economic activities such as aquaculture and fishery. When the LoE are integrated, the environmental risk seems to be intermediate or low with acceptable levels of uncertainty. The quality of the assessment relies on good references, such as comparable sites with desirable

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environmental status, earlier studies for background levels and relevant environmental quality criteria (EQC). Since a majority of the environmental quality criteria used in Vietnam derive from studies conducted in temperate regions it is questionable if they are suitable criteria in the tropical environment of Southeast Asia and this study shows that local site-specific environmental criteria as well as more background data from monitoring programs are needed in order to assess the ecological risks from growing human activities on coastal marine resources in Vietnam.

#### 5 **Ecological risks of antibiotics applied in freshwater cage aquaculture – a case study in tropical Thailand**

**A. Rico**, Wageningen University / Aquatic Ecology and Water Quality Management; R. Oliveira, University of Brasilia / Department of Genetics and Morphology; I. Domingues, University of Aveiro / CESAM Department of Biology; M.R. Dimitrov, Wageningen University and Research Centre; R. van wijngaarden; K. Satapornvanit, Kasetsart University; P. van den Brink, AlterraWageningen UR / Aquatic Ecology and Water Quality Management Group b Alterra  
Intensive aquaculture relies on the use of chemicals for the prevention and treatment of disease outbreaks, and constitutes one of the most important pathways for antibiotics into the environment. In this study we investigated the use, environmental fate and ecological risks posed by the use of antibiotics in tilapia cage farming in tropical Thailand. The use of antibiotics was investigated through interviews to 29 farmers, and concentrations of the most commonly used antibiotics, enrofloxacin (ENR) and oxytetracycline (OTC), were monitored in water and sediment samples collected in the Tha Chin and Mun Rivers. The toxicity of ENR and OTC was assessed by performing laboratory experiments with tropical freshwater invertebrates. Furthermore, the toxicity of ENR was assessed on five structural (macroinvertebrate, zooplankton, phytoplankton, periphyton and bacterial communities) and two functional (organic matter and nitrogen cycling) ecosystem endpoints by performing a microcosm experiment simulating the antibiotic exposure patterns found in the environment. All the interviewed farmers reported to routinely use antibiotics. Maximum antibiotic concentrations in the river water were 1.6 and 49 µg/L for ENR and OTC, respectively. Antibiotic residues were found in all the collected sediment samples, with concentrations between 1.4-2,339 µg/kg d.w. for ENR, and 4.5-4,062 µg/kg d.w. for OTC. The results of the laboratory experiments showed that tropical invertebrates are only moderately sensitive to water ENR and OTC concentrations. The results of the microcosm experiment did not show consistent treatment-related effects on the structure of the primary producer and invertebrate communities, however, demonstrated a reduction on the abundance of ammonia-oxidizing bacteria and archaea at measured environmental concentrations. Nitrification was only affected at concentrations above 100 µg/L, indicating that the aquatic exposure to ENR might have limited or no significant consequences for ecosystem functioning. We conclude that the ecological risks posed by antibiotic residues to primary producer and pelagic invertebrate communities seem to be minimal, however, more research is needed to assess the effects on benthic communities chronically exposed to antibiotic mixtures. The results of this study can be extrapolated to other tropical regions and contribute to further our understanding on the ecological risk assessment of antibiotics for tropical aquatic ecosystems.

#### 6 **Effects of Chlorpyrifos ethyl on cholinesterase activity in Climbing perch (Anabas testudineus , Bloch, 1792), from rice-fields in the Mekong Delta, Vietnam**

**T.T. Nguyen Thanh**, Nong Lam University / fisheries; H. Berg, Orebro University; C. Huyen, Can Tho University / College of Env Natural Resources; H.T. Nguyen, Nong Lam University / Faculty of Fishery  
**Abstract** Climbing perch (*Anabas testudineus*, Bloch, 1792), is commonly harvested in rice-fields in the Mekong delta. Despite its importance in providing food and income to local households there is little information about how this species is affected by the high use of pesticides in rice farming in the Mekong Delta. Organophosphate insecticides, such as chlorpyrifos, are commonly used and are highly toxic to aquatic organisms. This study show that brain AChE activity of climbing perch fingerling placed in cages within rice fields was significantly inhibited by single application of chlorpyrifos The water concentration of chlorpyrifos dropped below the detection limit within 3 days, but the inhibition of brain AChE activity remained for several more days. In addition, the chlorpyrifos treatments had a significant impact on survival and growth rates of climbing perch fingerlings, which was proportional to the exposure level. The results indicate that the high use of pesticides in the Mekong Delta could have negative impact on aquatic organism, fish yields and the aquaculture industry in the Mekong Delta. Keywords: *Climbing perch; Chlorpyrifos; acetylcholinesterase, Mekong Delta*

### Marine and coastal ecotoxicology and risk assessment (I)

#### 7 **Combined effects of two emerging environmental stressors (PFOS and CO2) on estrogenic and biotransformation responses of Atlantic cod (G. morhua) A. Arukwe**, NTNU / Department of Biology; G. Preus-Olsen, Norwegian University of Science and Technology NTNU / Biology; M. Olufsen, Norwegian University of Science and Technology NTNU; S.A. Pedersen, Norwegian University of Science and Technology NTNU / Biology; R.J. Letcher, Environment Canada / Ecotoxicology and Wildlife Health Division

Until now, little effort has been put into investigating interactive effects between POPs and elevated CO2 levels (hypercapnia) in the aquatic environment. In the present study, juvenile Atlantic cod were exposed to PFOS (0, 100 and 200 µg/L) for 1 hour/day in 5 days, followed by changes in elevated water CO2 saturation (0, 0.3 and 0.9%) for 3, 6 and 9 days. Endocrine disrupting potential of PFOS and elevated CO2 levels, both singly and in combination, were examined, in addition to steroid and xenobiotic metabolism (CYP1A, CYP3A) and HIF-1a. Elevated CO2 produced increased levels of E2, T, 11-KT with concomitant increases in mRNA expression of estrogen responsive genes. PFOS produced a weak time- and concentration-dependent estrogenic effect, but no effect on steroid hormone levels. Exposure to combined CO2 and PFOS produced gene expression patterns that are different from the effects observed for CO2 or PFOS alone, indicating interactive effects. Principal component analysis (PCA) did not produce significant components at day 3. The PCA for day 6 and 9 produced the best model fit, where particularly, the individual scores from the different CO2 scenario exposure groups tended to group separately. The resulting model contained three principal components (PCs) explaining a total of 56.4% of the total variation. When pooling the various exposure groups within each CO2 exposure scenarios, scores of three resulting CO2 groups were significantly separated along the first principal component (PC1; Q<sup>2</sup>=0.064) with increasing CO2 saturation (p[normal vs moderately increased CO2]=0.029, p[moderately vs highly increased CO2]=0.020), p[normal vs highly increased CO2]=0.000). PC1 mainly explained the individual variation within transcript levels of the estrogenic response genes, followed by levels of sex steroid hormones. These observations suggest that hypercapnia and emerging POPs such as PFOS in combination could modulate the estrogen signaling in juvenile Atlantic cod, with potential consequences for sexual development and reproduction. These findings suggest a potential for adverse effects of increased anthropogenic CO2 emissions on fish reproduction. This also raises the question whether such interactive effects might be observed in other aquatic species and with other endocrine disrupters and POPs as well. Such findings could have implications for the accuracy of current risk assessments of emerging POPs, under changing climatic conditions.

#### 8 **Parental exposure to environmental concentrations of diuron leads to aneuploidy in embryos of the Pacific oyster as evidenced by fluorescent in situ hybridization**

**A. Barranger**, F. Akcha, IFREMER / Department of Biogeochemistry and Ecotoxicology; R. Brizard, E. Maurouard, IFREMER; T. Burgeot, IFREMER / BIOGEOCHIMIE ECOTOXICOLOGIE; A. Benabdelmouna, IFREMER  
Over 80% of marine pollution comes from the mainland and originates from industrial, agricultural and urban activities. France is the leading user of agrochemicals in Europe. As a result of this high consumption of phytosanitary products, pesticides can contaminate coastal waters through various processes, including run-offs, leaching and spray drift. Genotoxicity is common to several families of major environmental pollutants, among them pesticides, which represent therefore a potential major environmental hazard for marine organisms. To investigate these points, the GIMEPEC (Genotoxicity, IMMunotoxicity and Eproxicity of Pesticides in *Crassostrea gigas*) project has been set up to study in the Pacific oyster the genotoxic effects of an herbicide, diuron, on the genome of genitors and, the possible transmission to the offspring of damaged DNA and its consequences on oyster fitness. Following exposure of genitors in active gametogenesis to environmental concentrations of diuron to two 7 day-exposure pulses, the genotoxicity of diuron was observed in both genitors, their gametes and the offspring using two complementary approaches, comet assay and flow cytometry. In spat from diuron-exposed genitors, a significant decrease in nuclear DNA content was measured, with over 15% of individuals showing DNA hypodiploidy. In this study, fluorescent *in situ* hybridization (FISH) was used to further characterize at the chromosomal level this diuron-induced DNA damage. rDNA genes (5S and 18-5.8-28S), previously mapped onto *C. gigas* chromosomes 4, 5 and 10, were used as probes onto interphase nuclei preparations. Results conclusively show higher aneuploidy (hypo- or hyperdiploidy) level in embryos from diuron-exposed genitors with damages on the three studied chromosomal regions. This work suggests that sexually developing oysters are vulnerable to diuron exposure, leading to negative impact on reproductive success and recruitment of oyster.

#### 9 **Single and mixture effects of selected emerging pollutants studied in Precision-cut liver slices of Atlantic cod (Gadus morhua)**

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The Society of Environmental Toxicology and Chemistry (SETAC) is a not-for-profit, global professional organisation comprised of some 5500 individual members and institutions dedicated to the study, analysis and solution of environmental problems, the management and regulation of natural resources, research and development, and environmental education.

SETAC Europe is one of five Geographic Units of the global Society, established to promote and undertake activities of SETAC in Europe, and to support the activities of SETAC in the Middle East and Russia. The Society is dedicated to the use of multidisciplinary approaches to examine the impacts of stressors, chemicals and technology on the environment. We also provide an open forum for scientists and institutions engaged in the study of environmental problems, management and regulation of natural resources, education, research and development, and manufacturing. SETAC Europe is incorporated in Belgium as a not-for-profit organisation. The Society is governed according to its articles of association and by-laws. SETAC Europe maintains its administrative office in Brussels, Belgium.



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