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10.12.2019 – 11.12.2019

Mikkeli, Finland

Abstract book



FINNISH SOCIETY
FOR ENVIRONMENTAL SCIENCE
YMPÄRISTÖTIETEELLINEN SEURA RY



South-Eastern Finland
University of Applied Sciences



**Tieteellisten seurain
valtuuskunta**



MAJ JA TOR NESSLINGIN SÄÄTIÖ

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PROGRAM 10.12.2019 TUESDAY

11:00-12:00 Registration

12:00-12:10 **Chair Mari Joensuu:** Opening words

12:10-12:40 **Pami Aalto:** How to promote sustainability transitions in road transport?

12:40-13:00 **Sini Saarimaa:** Adaptable housing for sustainable urban growth -
looking back to see forward

13:00-13:20 **Raysa França:** How dogs become invaders? Dog occupation in Tijuca
national park, Rio de Janeiro

13:20-14:15 POSTER SESSION & COFFEE

14:15-14:45 **Marianne Thomsen:** Biowaste and blue biomass valorization

14:45-15:05 **Katri Senilä:** Safety of biosolid-based fertilisers

15:05-15:25 **Jarkko Akkanen:** Carbon amendment technology for environmental
remediation

15:25-15:45 **Timo Ilo:** Emerging Contaminants in Finnish Aquatic Environments

16:00-16:45 Get together for students

19:00-22:00 **Conference Dinner**, Restaurant Talli

**Additional program (in Finnish) at Mikkelin Yliopistokeskuksen Auditorio,
Lönrotinkatu 5 (1,4 km from the Campus)**

17:00-18:30 Toivoa ja tekoja ympäristöahdistuksen taltuttamiseen (**Panu Pihkala ja
Essi Aarnio-Linnavuori**)

PROGRAM 11.12.2019 WEDNESDAY

- 08:30-09:00 Registration and coffee
- 09:00-09:30 **Panu Jouhkimo:** Mikkeli taking lead in circular economy: Ecosairila development platform and industrial area
- 09:30-09:55 **Jenni Kitti:** Experiences on participatory assessment tool involvement in environmental water quality monitoring
- 09:55-10:15 **Eeva-Riikka Vehniäinen:** Mechanisms of developmental toxicity of polycyclic aromatic hydrocarbons in fish
- 10:15-10:35 **Cyril Rigaud:** Combining omics for a better understanding of the cardiotoxic mechanisms of individual PAHs in fish early life stages
- 10:35-11:30 Lunch
- 11:30-11:50 **Andreas Eriksson:** Toxicity profiling: developing rainbow trout exposed to individual and binary mixtures of PAHs
- 11:50-12:10 **Victor Carrasco Navarro:** Toxicity of tire rubber, PS and PLA microplastics to *Chironomus riparius*
- 12:10-12:30 **OPEN SLOT**
- 12:30-13:00 Awarding Ceremony
- 13:00-13:15 Closing words

POSTER PRESENTATIONS ON 10.12.2019 (ROOM A235)

1. **THERESA SANDMANN**
Effect of coloured mulch films on the landing behaviour of winged aphids
2. **LAURA TUOMINEN**
Cooperation, evolution and resource management
3. **BHABISHYA GURUNG**
Novel sorbent amendments for environmental remediation
4. **YIHUA XIAO**
Unraveling long-term changes in lake color based on optical properties of sediment dissolved organic matter
5. **VICTOR CARRASCO NAVARRO**
Toxicity of neonicotinoids and other pesticides to *Chironomus riparius*: pulse, chronic and multigenerational tests
6. **MIKA KÄHKÖNEN**
Effects of holmium and lithium to the growth of basidiomycetous fungi and their ability to degrade textil dyes
7. **TUIJA RANTA-KORHONEN**
Biocom project: Bioeconomy promotion in border rural areas
8. **RIINA TUOMINEN**
Predictability of wastewater amount
9. **HANNE SOININEN**
Effect of MBR sludge on anaerobic digestion in continuous bioreactors
10. **SALLA PULLIAINEN**
VOC-online – development of online sensor technology to ensure healthy indoor climate

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ORAL PRESENTATIONS



FINNISH SOCIETY
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HOW TO PROMOTE SUSTAINABILITY TRANSITIONS IN ROAD TRANSPORT?

Pami Aalto, Faculty of Management and Business/Politics Unit, Tampere University

Road transport requires rapid emission reduction solutions since it accounts for over 10% of global CO₂ emissions and over 20% in developed countries. This sector is also relatively well placed for reductions compared to other highly polluting sectors since the vehicle stock is renewed more often than for example the residential housing sector while it lacks similar constraints as found in the energy and industrial sectors where very large vested interests, well-formed interest groups and high sunk costs persist. Electrification is a frequently discussed solution in the context of road transport. For this end, this presentation introduces two clusters of work within the EL-TRAN consortium (Strategic Research Council, 2015-21). First, it takes up the example of electric vehicle (EV) policies in the Nordic countries to accelerate sustainability transitions in the sphere of road transport. We compare the deployed policy instruments in Denmark, Finland, Norway and Sweden and the manner by which these have managed to negotiate the country-specific technological, infrastructural, institutional and behavioral lock-ins and constraints. However, while electrification of personal vehicles is possible, for example in Finland, according to a recent estimate, only up to 35% of heavy duty trucks can be electrified. Therefore, further solutions such as electric roads and the use of gaseous fuel solutions such as biomethane are needed as an alternative to liquid biofuel solutions which in many cases have sustainability problems. In our example, in the case of Finland, combined with the potential of electrification, we find that the use of biomethane would enable running the entire heavy duty truck fleet without the use of fossil fuels, with costs competitive in relation to diesel price and with a 50% reduction in CO₂ emissions. To accelerate the EV and biomethane solutions, a more comprehensive political framework is needed, paying attention to sectoral interdependencies whilst also noting the several co-benefits enabled by the same interdependencies in order to promote sustainability transitions in the road transport sector.

ADAPTABLE HOUSING FOR SUSTAINABLE URBAN GROWTH - LOOKING BACK TO SEE FORWARD

Sini Saarimaa, Tampere University

To build cities in a sustainable manner, much attention is given to the energy use of buildings. Lately, the perspective has shifted towards the use of renewable and recycled materials and extending buildings' life cycles. This is due to the growing understanding of the limited raw materials, a situation that calls for circular economy. Hence, the link between circularity and the idea of spatial adaptability (i.e. physical space accommodating changing conditions over time) is widely acknowledged. Despite the long traditions of housing adaptability research, there is a lack of well-established methods to study the linkages between residential buildings' qualities and their potential to adapt. For example, we are not well equipped to analyze which properties and relationships of the buildings' support create the conditions for meaningful user adaptations. To address this gap in knowledge, the presentation proposes a systematic model for qualitative assessment of an apartment's adaptation potential and uses this model in studying Finnish apartment building's capacity to accommodate dweller-driven changes. The examples studied represent various decades of Finnish urban housing construction. Lessons can be learned for the future developments: key aspects for designing adaptable housing for sustainable urban growth are summarized.

HOW DOGS BECOME INVADERS? DOG OCCUPATION IN TIJUCA NATIONAL PARK, RIO DE JANEIRO

Raysa França, Tampere University

The occupation of invasive alien species in protected areas is an important subject in biological research. However, although some discussion has been developed in social sciences, the subject of invasive species has not received enough attention. In this context, this article presents the results of anthropological research concerning the occupation of domestic dogs (*Canis lupus familiaris*) in Tijuca National Park (PNT or Parna Tijuca), in Rio de Janeiro, Brazil. The investigation focuses on the process through which domestic dogs become invaders. Matters of concern include concepts such as “nativeness”, “nature”, and “savagery”. The methodology consisted of content analysis; online and on-site interviews with PNT’s staff; and lastly, a fieldwork visit carried out in May 2019. Results indicate that the repertoire mobilized by ecology hides crucial elements that influenced invasive species management in PNT, such as national identity, uniqueness of Rio de Janeiro’s landscape and the history of the PNT. It is argued that subjective, cultural, symbolic, communicational and contextual dimensions of the science of these definitions need to be considered in invasive species management.

SAFETY OF BIOSOLID-BASED FERTILISERS

Katri Senilä, Finnish Environment Institute, University of Eastern Finland

Salla Selonen & Matti Leppänen and Markus Sillanpää, Finnish Environment Institute; Jarkko Akkanen, University of Eastern Finland

Significant part of sewage sludge, also known as biosolids, produced by sewage treatment plants is used as fertiliser in agriculture. Biosolids are rich in nutrients, such as phosphorus and nitrogen. They have also proven valuable soil amendments. However, biosolids also contain harmful substances, among which are heavy metals, human pathogens, microplastics and organic contaminants. Recent studies suggest that repeated land applications of biosolids have only minor adverse effects on environment, crops and human health. In fact, organic carbon in biosolids may even decrease the bioavailability of certain compounds in treated soils. Nevertheless, several crop refineries have refused to purchase crops from biosolid-fertilised field plots, invoking the precautionary principle. This has led to increasing interest of sewage sludge incineration which is, however, against the principles of the circular economy. Moreover, the incineration of biosolids is costly and causes emissions of dioxins and other pollutants to air. BIOLTA project is aimed to find reliable ways to study the safety of biosolid-based fertilisers and provide information for decision-makers.

CARBON AMENDMENT TECHNOLOGY FOR ENVIRONMENTAL REMEDICATION

Jarkko Akkanen, University of Eastern-Finland

Black carbon has been shown to be an important sorbent for hydrophobic organic pollutants in sediments. That observation has led to research on addition of carbon to contaminated sediments as a remediation method. Activated carbon has been used in several laboratory and field studies. It has been shown to be an efficient amendment to bind contaminants and reduce their bioavailability. However, some problems exist. Smaller particle sizes have the highest remediation potential, but the behavior in water may be a problem. Also, some adverse effects on benthic organisms exist. This presentation describes a material that may overcome these problems.

EXPERIENCES ON PARTICIPATORY ASSESSMENT TOOL INVOLVEMENT IN ENVIRONMENTAL WATER QUALITY MONITORING

Jenni Kitti, KAMK University of Applied Sciences

*Outi Laatikainen, KAMK University of Applied Sciences; Susanne Mulbah, the ALC,
King's College (London)*

The paper presents a field pilot of stakeholder participation in water quality monitoring at the area, in which industrial operations might be affecting the water quality in local water bodies. The paper assesses reliability and validity factors of measurement results. The objectives were twofold: to explore technical solutions and crowdsourcing in environmental water quality monitoring in field settings, and to assess social acceptance and cost-effectiveness compared to traditional monitoring methods. In several industrial sectors, Social License to Operate (SLO) and Free Prior Informed Consent (FPIC) have become industry standards. This development path is still very often not reached concerning environmental assessment of waste management operations.

In the lake located in a mining-intensive region, affected community members used mobile phones data management platform application to report on-site readings from commercial-quality colorimetric reagent strips. The collected data from the measurement devices were transferred to an information management platform. To minimize data unreliability, the calibrated primary readings and data was run through a set of comparable data sets to eliminate deviation.

We conclude that stakeholder participation in environmental monitoring not only has the potential to provide more frequent and more nuanced primary data, but also allows wider area coverage than is typically facilitated by monitoring protocols, especially in remote regions and disperse settlements. The pilot further revealed that stakeholder participation in environmental monitoring build social capital and reduce social risk, and thus could be incorporated in the current industry environmental monitoring protocols. Keywords: water quality monitoring in industrial projects, stakeholder participation, waste assessment tools, social acceptability

MECHANISMS OF DEVELOPMENTAL TOXICITY OF POLYCYCLIC AROMATIC HYDROCARBONS IN FISH

Eeva-Riikka Vehniäinen, University of Jyväskylä

Cyril Rigaud and Andreas Eriksson, University of Jyväskylä; Aleksei Krasnov, Norwegian Institute of Food, Fisheries and Aquaculture Research, Ås (Norway); Markku Keinänen, Jaakko Haverinen and Matti Vornanen, University of Eastern Finland, Joensuu; Anne Rokka, Turku Bioscience; Jenna Lihavainen, University of Eastern Finland Joensuu & University of Helsinki; Morten Skaugen, Norwegian University of Life Sciences, Ås (Norway)

Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous contaminants. Many of them cause developmental defects in fish, especially in cardiovascular tissue. The mechanisms of toxicity remain largely unresolved for many PAHs. Rainbow trout (*Oncorhynchus mykiss*) larvae were exposed to PAHs that act via different mechanisms of toxicity: Retene, an aryl hydrocarbon receptor (AhR) agonist causing dioxin-like toxicity; pyrene and phenanthrene, weak AhR agonists causing toxicity independently of AhR; and fluoranthene, a CYP1A inhibitor interfering with PAH metabolism. Information was gained at multiple levels of biological organization to reveal the mechanisms of toxic action. Cardiac transcriptome, proteome and metabolome were explored, and heart function, growth, yolk consumption, and developmental defects were monitored. Each PAH caused a unique pattern in OMICS analyses. Retene, phenanthrene and fluoranthene impaired cardiac function. PAHs also affected cardiomyocyte electrical characteristics. Different PAHs clearly have different mechanisms of toxicity. The transcriptomic changes can at least partly account for the toxicity of retene, but the cardiotoxicity of PAHs also seems to involve a direct effect on cardiac ion channels

COMBINING OMICs FOR A BETTER UNDERSTANDING OF THE CARDIOTOXIC MECHANISMS OF INDIVIDUAL PAHs IN FISH EARLY LIFE STAGES

Cyril Rigaud, University of Jyväskylä

Andreas N. M. Eriksson and Eeva-Riikka Vehniäinen, University of Jyväskylä, Jyväskylä (Finland); Aleksei Krasnov, Norwegian Institute of Food, Fisheries and Aquaculture Research, Ås (Norway); Morten Skaugen, Department of Chemistry, Biotechnology and Food Science, Norwegian University of Life Sciences, Ås, Norway; Anne Rokka - Turku Centre for Biotechnology, University of Turku and Åbo Akademi University, Turku, Finland; Jenna Lihavainen and Markku Keinänen, Department of Environmental and Biological Sciences, Joensuu Campus, University of Eastern Finland, Joensuu, Finland

We explored the mechanisms of cardiotoxicity of individual polycyclic aromatic hydrocarbons (PAHs) in the rainbow trout (*Oncorhynchus mykiss*) early life stages (ELS) by the use of an integrated OMICS approach (combined transcriptomics, proteomics and metabolomics). Rainbow trout larvae were exposed to individual PAHs (retene, pyrene or phenanthrene) at sublethal doses. Both transcriptomics and proteomics in the cardiac tissue gave consistent results, and showed different signatures of altered gene expression and protein levels between compounds, suggesting specific mechanisms of toxicity. Retene was the most potent PAH tested. It significantly altered the expression level of several genes/proteins involved in key cardiac functions such as muscle contraction (actin binding, troponin and myosin complexes), cellular tight junctions and calcium homeostasis. Pyrene was also able to alter similar myosin-related genes, but at a different timing and in an opposite direction. Pyrene altered key genes and proteins linked to the respiratory electron transport chain and to oxygen and iron metabolism. Overall, phenanthrene was not very potent in inducing changes in the cardiac tissue at the molecular level. Studies are underway in order to assess if those changes at the molecular level can be linked to changes in the cardiac function of the rainbow trout ELS.

TOXICITY PROFILING: DEVELOPING RAINBOW TROUT EXPOSED TO INDIVIDUAL AND BINARY MIXTURES OF PAHs.

Andreas N. M. Eriksson, University of Jyväskylä

Cyril Rigaud and Eeva-Riikka Vehniäinen - University of Jyväskylä (Finland); Aleksei Krasnov, Norwegian Institute of Food, Fisheries and Aquaculture Research, Ås (Norway)

We investigated how early life development in newly hatched rainbow trout is affected by exposure towards individual and mixtures of polycyclic aromatic hydrocarbons (PAHs). Exposure occurred over a concentration gradient towards retene and fluoranthene (RetFlu); pyrene and fluoranthene (PyrFlu); and phenanthrene + fluoranthene (PheFlu). These exposures were maintained for 1, 3 and 7 days.

By the end of each exposure duration, we observed alterations of several biometrical endpoints such as reduced standard length, phenotypical alterations and signs of developmental toxicity and symptoms of the blue sac disease (edemas, hemorrhages, craniofacial deformities and curved spine) which related well to the bioaccumulation and metabolism of PAHs. The strength of toxicity was ranked as follows: RetFlu > PyrFlu > Ret > Flu > PheFlu > Pyr > Phe. These findings related well to what we have observed in our transcriptomic data; that the toxicity profile following exposure towards a mixture cannot be assessed by the individual components.

TOXICITY OF TIRE RUBBER, PS AND PLA MICROPLASTICS TO *CHIRONOMUS RIPARIUS*

Victor Carrasco Navarro, University of Eastern Finland

Sorvari, J. University of Eastern Finland, Department of Environmental and Biological Sciences

The contamination of worldwide waters with plastics in general and microplastics (MPs) in particular is one of the most important water risks and chemical pollution episodes that has ever existed during the history of mankind. We studied the toxicity of three types of microplastics in *Chironomus riparius*. *C. riparius* is a widely used organism in toxicity tests and an important prey of fish, birds and terrestrial organisms. The microplastic materials used were tire rubber, polystyrene (PS) and polylactic acid (PLA), spiked to sediment at three concentrations (1, 3 and 10% of sediment dry wt). Animals were exposed during their whole life cycle until emergence. Endpoints that were monitored were time of emergence, emergence rate, sex ratio and reproduction.

The results showed that the emergence curves of the controls are significantly different from the curves belonging to any other microplastic treatment except PLA 3%. However, no differences were found in the final emergence rates (28d) and in the sex ratios.

The present study adds valuable and missing information about the toxicity of microplastics of three widely used materials to an essential species in freshwater ecosystems.

POSTER PRESENTATIONS



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NOVEL SORBENT AMENDMENTS FOR ENVIRONMENTAL REMEDIATION

Bhabishya Gurung, University of Eastern Finland

Sebastian Abel, University of Eastern Finland & Helmholtz Centre for Environmental Research, Leipzig (Germany); Jarkko Akkanen, University of Eastern Finland

Applying activated carbon (AC) amendments to contaminated sediments is a promising remediation method. Although powdered AC (PAC) has a high sorption capacity, the adverse effects on organisms can be also high. Granular AC (GAC) has lower ecotoxic effects but may not be effective enough to sequester contaminants. A novel, granular PAC-clay composite (ACC-G) was developed, with the aim of reaching high remediation efficiency and less ecotoxic effects. This study compares the adverse effect of ACC-G, GAC and PAC mixed with sediment at doses of 4% and 7.5% on the benthic invertebrate *Lumbriculus variegatus*. The findings showed PAC implemented sediment had a decrease in overall biomass of the organisms. A slight increase on the biomass of the organisms in both GAC and ACC-G in comparison to untreated control sediment where biomass more than doubled during the experiment period. In conclusion, ACC-G seem to provide a more eco-friendly way to deliver PAC into contaminated sediments as the particle size of sorbents had significant ecotoxic effect on the organism.

UNRAVELING LONG-TERM CHANGES IN LAKE COLOR BASED ON OPTICAL PROPERTIES OF SEDIMENT DISSOLVED ORGANIC MATTER

Yihua Xiao, University of Jyväskylä

Thomas Rohrlack and Gunnhild Riise, Faculty of Environmental Sciences and Natural Resource Management, Norwegian University of Life Sciences, Ås (Norway)

A number of boreal surface waters have become browner over the last two decades. Recovery from acid rain is regarded as an important driver for this lake color increase, indicating a general browner lake color in preindustrial times. However, the lack of long-term monitoring data makes it challenging to unravel historical changes in lake color. In this study, we estimated long-term development in lake color (1800 to 2015) based on the optical properties of alkaline extractable dissolved organic matter (DOM) from sediment using UV-Vis and fluorescence spectroscopy. We found that the present lake color (2015) was significantly browner (four times higher in absorption coefficient) than for the period from 1800 to 1915 when lake color was at a lower and more stable level. Fluorescence excitation–emission matrices combined with parallel factor analysis (EEM-PARAFAC) indicate that terrestrially derived DOM was the main source of sediment DOM. However, the importance of in-lake source of DOM has significantly increased with time. The long-term trend in DOM burial was not consistent with the anthropogenic sulfur (S) deposition pattern. However, along with the increased sediment DOM, there has been increased precipitation, temperature and forest growth with time, which affect the production and degradation of DOM. Even though S deposition might have delayed the runoff of terrestrial DOM for a certain period, it comes in addition to other color-regulating factors. Thus, there is no single driver for the observed lake browning, but rather an interplay between different drivers varying in strength over time, such as afforestation, changes in areal use, declined S deposition, and increased temperature and precipitation.

LANDING BEHAVIOUR OF WINGED APHIDS ON COLOURED MULCH FILMS

Theresa Sandmann, University of Bonn

Niklas Stukenberg and Thomas Döring, University of Bonn, Rheinische Friedrich-Wilhelms-Universität, Bonn (Germany)

Aphids are important pests and virus vectors in agriculture. Winged females migrate to new host plants. Aphids can recognize colours by three photoreceptors. The landing behaviour is influenced by the contrast of colour between traps and backgrounds and the reflectance of the background.

In this experiment the landing behaviour of winged aphids on green traps situated on coloured mulch films and bare soil was investigated. The used traps had three different sizes. The experiment was conducted in May when winged aphids migrate to find new colonies. Green traps represented plants. It was found out that the pan position had no big influence. The results showed that half of the trapped aphids (51.8%) were trapped on bare soil and just 2.9% aphids were trapped on silver mulch films. Furthermore, more aphids were trapped in larger traps than in smaller traps. From these results it is concluded that silver mulch films are appropriate to reduce aphid infestation on plants without using pesticides.

COOPERATION, EVOLUTION AND RESOURCE MANAGEMENT

Laura Tuominen, University of Turku

Timo Vuorisalo & Douglas Richmond and Jon Brommer, Department of Biology, University of Turku; Patrik Karell, Bioeconomy Research Team, Novia University of Applied Sciences; Lauri Rapeli, The Social Science Research Institute, Åbo Akademi, Turku; Heikki Helanterä, Department of Biology, University of Oulu

In my doctoral thesis, I study what kind of human groups succeed to manage sustainably their shared resources. I analyze groups' composition, cooperation and decision-making processes in different empirical case studies. The intention is to find answers from evolutionary biology, where successful cooperation in non-human groups has been explained using several different theories. By combining the knowledge from these theories and theories from social sciences, such as social ecological systems framework, I believe it is possible to understand better how to manage shared resources.

I would like to present my ongoing case study, in which I study urban garden boxes as a small natural resource. Urban garden boxes are often managed by self-organized groups. Urban gardening is becoming increasingly popular and it has been found to create all kinds of aesthetic, spiritual and psychological benefits in addition to economic gains. Resources gained from the urban garden boxes are divided in two variables; economic value of the harvest and the social value of the garden box activity. The key variables explaining well-functioning cooperation are surveyed to study what factors influence the governance of urban garden boxes.

TOXICITY OF NEONICOTINOIDS AND OTHER PESTICIDES TO CHIRONOMUS RIPARIUS: PULSE, CHRONIC AND MULTIGENERATIONAL TESTS

Victor Carrasco Navarro, University of Eastern Finland

*J. Sorvari, University of Eastern Finland, Department of Environmental and
Biological Sciences*

Neonicotinoid insecticides (NNIs) were included in the EU watch list substances for emerging water pollutants (Decision 2015/495) and recently, three of them have been banned from outdoor use. They are very persistent contaminants in soils, with DT_{50} reaching thousands of days. From soils, NNIs leach to water bodies due to their solubility and are found extensively around the globe. Additionally, they are toxic to beneficial organisms, especially insects.

In our study, we investigated the toxicity of pesticide mixtures to the aquatic insect *Chironomus riparius* (Diptera: Chironomidae) through growth, emergence and second-generation tests with both chronic and pulse exposures. Insects were exposed in water-sediment systems to the neonicotinoid thiacloprid as the main compound. Thiamethoxam, propiconazole, triasulfuron, azoxystrobin and MCPA were added subsequently to test the toxicity of mixtures. Concentrations of the single compounds never exceeded $2\mu\text{g L}^{-1}$ and $10\mu\text{g L}^{-1}$ in the chronic and pulse exposures, respectively.

Although survival was not affected, every single combination of the pesticides tested caused an inhibition in the growth of *C. riparius* over 10d tests when compared to unexposed larvae. A mere $0.5\mu\text{g L}^{-1}$ of thiacloprid caused a significant inhibition of growth.

During the emergence experiment, larvae were exposed to chronic or pulse concentrations of the same combinations of pesticides as in the growth tests. Adult emergence, sex ratio and number of eggs per female were recorded. In general, pulse exposures affected the emergence and sex ratio of adult chironomids more than the chronic exposures.

The results of the second-generation studies showed no major differences in the growth of larvae despite the conditions in which the first generation were reared.

Overall, the present study adds important information about the toxicity of NNIs and pesticide mixtures to aquatic insects, raising questions about the importance of pulse exposures in the risk assessment of pesticides. Moreover, it highlights the need of more studies on the toxicity of pesticides to several generations of insects to establish a link with the real status of insect populations.

EFFECTS OF HOLMIUM AND LITHIUM TO THE GROWTH OF BASIDIOMYCETOUS FUNGI AND THEIR ABILITY TO DEGRADE TEXTIL DYES

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Harmful metal waste is produced at all phases of products life cycle from production to consumption and after the product has been discarded to landfills or wastewaters. We tested effects of Ho and Li (0, 10, 50, 100 mg kg⁻¹) to the growth of four basidiomycetous fungi, decolorisation of synthetic dyes (Reactive Green 19, Reactive Orange 16, Reactive Black 5), and the production of oxidative enzymes such as laccase, manganese peroxidase (MnP) and versatile peroxidase (VP). Tested basidiomycetous species; *Agrocybe dura*, *Skeletocutis biguttulata*, *Exidia saccharina* and *Galerina paludosa*; grew with and without Ho or Li. The growth of *G. paludosa* was the most sensitive whereas *S. biguttulata* tolerated both Ho or Li up to 200 mg/kg. All fungi showed laccase activity, which was tested by colour formation in ABTS (2,2'-azino-bis(3-ethylbenzthiazoline-6-sulfonic acid) plates. In addition, *A. dura* and *G. paludosa* formed black MnO₂ zone in Mn²⁺ plates, which indicates MnP activity. *A. dura* decolorised all tested dyes with and without Ho or Li (0 – 200 mg/kg) whereas *S. biguttulata* and *E. saccharina* did not decolorise any of the tested dyes. This study is first to show that fungi, *A. dura* and *G. paludosa*, are able to decolorise dye Reactive Black 5, which suggests production of VP enzyme. *A. dura* decolorised all tree dyes indicating that this fungus is suitable for bioremediation of multi dye containing wastes.

BIOCOM PROJECT: BIOECONOMY PROMOTION IN BORDER RURAL AREAS

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Bioeconomy is one of the most important innovative areas in ensuring the sustainable development of various territories and whole states. It is based on the widespread use of biotechnology and the biological renewable resources for production and energy generation. Bioeconomy approach provides additional opportunities to solve global problems such as food shortages connected with population growth, mineral resources depletion, environment pollution. Modern biotechnology allows for high life quality, health care and social security.

In the Russian Federation and the Republic of Finland the bioeconomy introduction is actively supported at the government level.

In April 2012 was approved the State Comprehensive Biotechnology Development Program in the Russian Federation for the period up to 2020. An important step in accelerating this process was signing of the Paris Climate Agreement in Russia on September 23, 2019.

Finland is a pioneer in many areas of bioeconomy, including the production of bioenergy and biofuels from organic waste and plant raw materials. To reduce the hydrocarbons in industrial production, Finland adopted the National Strategy for Bioeconomy in 2014

DRONE MAPPING AS A PART OF BUILDING DOCUMENTATION

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Project “VOC-Online – Development of online sensor technology to ensure healthy indoor climate” studied utilizing drone mapping as a part of building documentation. The surrounding conditions of the building effects to its construction and indoor air quality. Using drone acquires new, real-time and high-resolution geographic dataset and survey information about the object and immediate surroundings. Utilizing the geographic dataset it is possible to bring environmental factors under examine as a part of the life cycle documentation of the building. With this method, it is also possible to investigate sites that are hard to access. Drone mapping enables for example regular consideration and documentation of roofs and funnels. The storm water drainage and accumulation, and effects of the sun light, shadows and wind in the site can be evaluated, modelled and visualized with the exact information of the terrain and subgrade. Utilizing drone mapping in documentation and 3D modelling of the buildings offers tools to descriptive analysis and maintenance. The project and work is funded by the ELY Centre for South Savo via the European Regional Development Fund, Järvi-Saimaan palvelut Ltd, South Savo Rescue Department and Marjatta and Eino Kolli foundation.

PREDICTABILITY OF WASTEWATER AMOUNT

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The amount of wastewater entering to the wastewater treatment plants can be estimated by comparing it with the amount of clean water used. In general, the quantities of household water and wastewater are estimated to be equal. However, the amount of wastewater is increased by runoff water, which consists different types of stormwater and water leakage. Runoff water can be 30-50% of the total amount of wastewater and this affects to the estimation.

The study made by South-Eastern University of Applied Sciences showed that even simple models can predict the amount of wastewater coming to wastewater pumping stations. Rainfall and wastewater flow rates can be used to evaluating the amount of wastewater. However, there was a great deal of variation between pumping stations. There were some changes in the amount of wastewater in the analysed data, which could not be explained by the analysed variables, but were due to other factors. In addition, the study also included pumping stations which would have required completely different models to predict the amount of wastewater.

EFFECT OF MBR SLUDGE ON ANAEROBIC DIGESTION IN CONTINUOUS BIOREACTORS

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Anaerobic digestion of different kind of sludges from wastewater treatment processes are an important part in recycling of waste resources and producing bioenergy. However some of these sludges may cause negative effect on biogas and methane production due to chemical residues, for example antibiotics. In this study, the effect of MBR sludge, which is produced in wastewater treatment processes, on methane production rates were investigated by using continuous 15 L anaerobic digestion reactors. As a feedstock pure grass and with 1:1 ratio grass and MBR sludge were used. Reactors were run for 190 days and same time information about biogas and methane production rates, pH, alkalinity, C:N ratio and nitrogen amount was collected. Also the effect of total interruption of feeding on bioreactors were investigated. In both reactors biogas and methane production rates varied based on OLR and HRT values.

During active phases of run biogas production varied from 276 to 571 mL/gVS d (avg.) for mixture of membrane bioreactor (MBR) sludge and grass and from 277 to 577 mL/gVS d (avg.) for pure grass. Amount of methane in biogas varied from 21 to 59 % for mixture of MBR sludge and grass and from 35 to 56 % for pure grass. Result of the study shows, that the MBR sludge used in the tests slightly reduced amount of produced biogas. This may be because the ferrous sulphate, which is used as chemical coagulant in waste water treatment process, weakens the microbial activity.

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