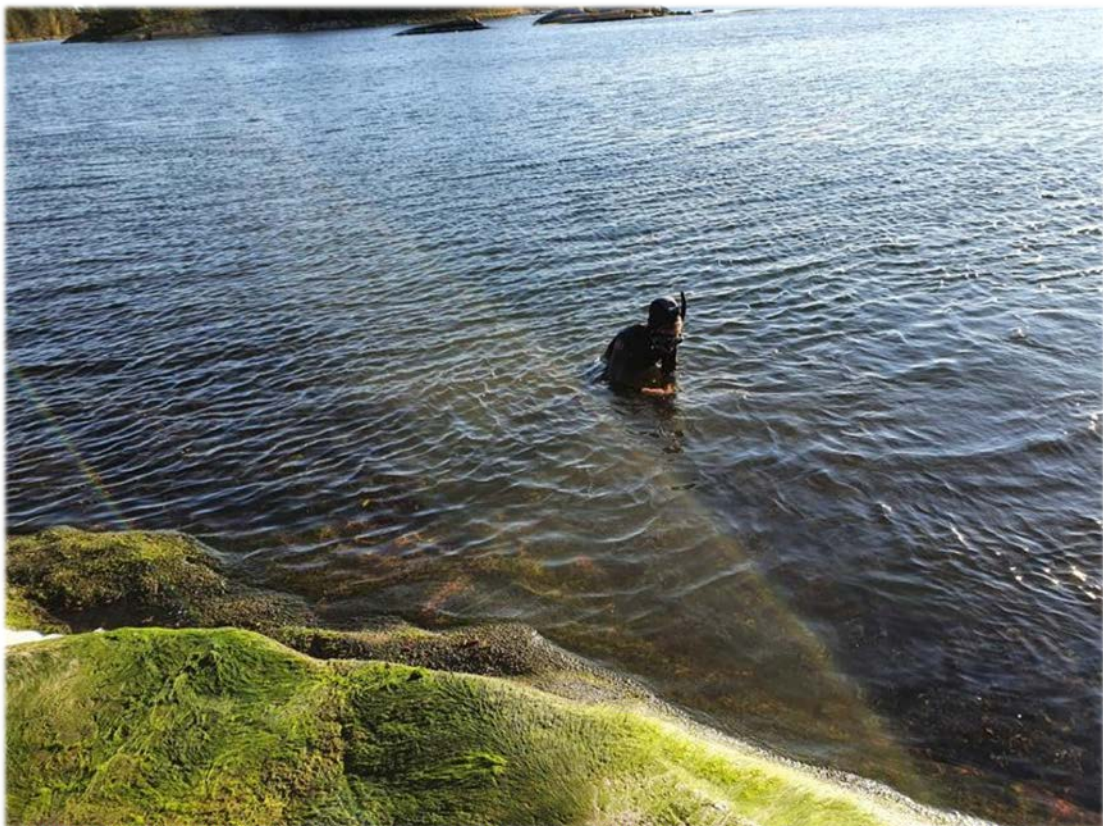


Novia UAS Campus Raseborg

Research & Development

2019



Contents

Contents	3
Preface	4
The Novia Raseborg Bioeconomy Research Team	5
Climate change and Baltic Sea plankton	5
Drivers of plankton populations in the Baltic Sea	7
Biomarker and lipid profiles reveal salinity and warming induced forcing in marine zooplankton	8
Novel biomaterials derived from the lignocellulostic feedstock promoting sustainable development and environmental protection	9
Seizing Bioeconomy opportunities in sustainable food development	11
Functional ecology and applications	13
Ecophysiological adaptations to climate change	15
LES: Life quality in Raseborg	17
Ecology of forest raptors and archipelago birds	18
Statistical population ecology	20
The White fish of Åland Islands - spawning grounds and origin	21
The great cormorant project	22
Teaching	23
Publications and media appearances	24
Research and Development projects	27
Research and Development in Bioeconomy 2019	27
St Olav Waterway	29
Välmående av vilt - Hyvinvointia riiststa	30
Smart Marina - Contemporary harbours with soft energy technology	31
Matregion Nyland - Ruokamaakunta Uusimaa	32
Digitalisaatiolla luonnonvarat biotalouteen - DLB	34
Bondenyttan	35
Novia Raseborg R&D, Personnel	36
Novia Raseborg R&D, Funding	37

Sustainable bioeconomy - our responsibility and possibility in the work for combating climate changes

In February 2020 Novias Board of Direction adopted a new strategy setting up our strategic goals for 2030. In our strategy we describe our areas of strength and expertise, our knowledge base, enabling us to reach our defined goals. One of the three goals for 2030 is global orientation for a sustainable future. A fundamental base for this is one of Novia's areas of strength, developing and applying solutions for global sustainability.

Novia has long experience in developing and applying solutions for global sustainability, especially in ecological and technological terms. The current global use of natural resources has led to a sustainability deficit and increased the need for ecological reconstruction methods. In order to find the right methods research and development within bioeconomy and sustainable use of natural resources is crucial. We are confident that our long-term focus on sustainable use of natural resources, both within research and development and education, will contribute to finding sustainable solutions strengthening and maintaining the welfare society.

I hope this research report of activities and achievement 2019 will give you an insight in how we are working and contributing towards a sustainable future.

Eva Sandberg-Kilpi

Dean, Faculty of Bioeconomy



Climate change and Baltic Sea plankton

Jonna Engström-Öst, Louise Forsblom, Ella von Weissenberg and Anna Jansson

We study how climate change and eutrophication affect plankton in the marine environment with focus on the Baltic Sea. We measure biomarkers, reproductive output and many other variables to increase our understanding of mechanisms behind the impact of warming and ocean acidification in the coastal zone.

We visited University of Montpellier in Sète in the south of France in May and June to participate in a heat-wave experiment in the field. The aim of the work was to study the effects of heat-wave on the eco-physiology of the Mediterranean zooplankton community. We collaborated closely with a Greek zooplankton team, led by Soultana Zervoudaki. Due to some unexpected problems in the beginning, such as abundant jellyfish feeding on the zooplankton before filling up the mesocosm bags, it took a while before we got the first samples. Nevertheless, at the time when Anna Jansson and Jonna Engström-Öst travelled back to Finland, the experiment was up and running. Zooplankton were collected for biomarkers, lipid profiles and abundance monitoring. During 2020, Ella von Weissenberg will analyse the data that will be part of her PhD thesis.

The main paper comparing copepod and pteropod eco-physiological responses to ocean warming and acidification in the California Current System was published in March in Scientific Reports. The co-authors on the paper Simone R. Alin, Nina Bednaršek



BSc student Ken Granström and supervisor Anna Jansson measuring mussels in the water treatment plant.

and Richard A. Feely are currently planning a follow-up cruise, the West Coast Ocean



Mesocosm enclosures during heatwave experiment in Station Marine de l'Université de Montpellier à Sète.

Acidification cruise onboard NOAA's leading research vessel *Ronald H. Brown* taking place between August and September 2020. The focus of the plankton teams will be on eco-physiological status, lipid profiles, phenotypic changes such as body size, and metabolomics (in collaboration with Piero Calosi, Québec University).

We visited several meetings in 2019. Oral presentations were given at Oikos Finland 5-6.2. in Uleåborg, and at the *Eurytemora* meeting 10-11.5. in St. Petersburg Russia, and BALSAM ocean acidification mitigation meeting 10-11.10 organised by Marko Reinikainen at AirClim in Gothenburg Sweden.

Hur påverkas plankton av en förändrad miljö? Vi forskar i hur klimatförändringen samt övergödningen i den marina miljön påverkar plankton i Östersjön. Vi jobbar främst med djurplankton och undersöker deras reproduktionsframgång, stressnivåer samt populationsdynamik. Projektet är finansierat år 2019 av Svenska kulturfonden, Onni Talas säätiö och Waldemar von Frenckells stiftelse, Finlands akademi (2018) och FunMarBio vid Åbo Akademi (Louise Forsblom).

Collaborators

- Bednaršek Nina, Southern California Water Research Project, USA
- Candolin Ulrika, University of Helsinki, Finland
- Feely, Richard A., National Oceanic and Atmospheric Administration, USA
- Keister Julie, University of Washington, USA
- Klais Riina, Estonian Research Information System, Estonia
- Lehtinen Sirpa, Finnish Environment Institute, Finland
- Lehtiniemi Maiju, Finnish Environment Institute, Finland
- Alexandra Lewandowska, University of Helsinki, Finland
- Lindén Andreas, Novia University of Applied Sciences, Finland
- Långvik Otto, Novia University of Applied Sciences
- Riebesell Ulf, GEOMAR - GEOMAR Helmholtz-Zentrum für Ozeanforschung, Germany
- Almén Anna-Karin, Tvärminne Zoological Station, Finland
- Scheinin Matias, Municipality of Hanko
- Vuori Kristiina, University of Turku, Finland



Anna Jansson, Marko Reinikainen, Jonna Engström-Öst, Anna-Karin Almén and Tobias Tamelander at University of Gothenburg for the ocean acidification mitigation meeting BALSAM.

Drivers of plankton populations in the Baltic Sea

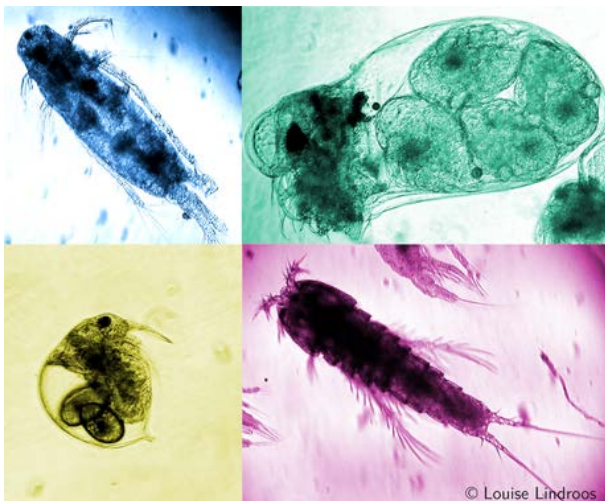
Louise Forsblom

My PhD project mainly focuses on extrinsic drivers of phyto- and zooplankton population dynamics. To this end I use long time-series of data and population dynamical modelling. A related aim is to also account for potential error sources that influence the observation process. My PhD is supervised by Andreas Lindén (Luke, prev. Novia), Jonna Engström-Öst (Novia), and Kai Lindström (ÅA).

The two first articles that will be part of my thesis, were published in 2019. The articles explore extrinsic drivers of annual biomass in auto- and heterotrophic plankton in the Gulf of Finland, and the spatial synchrony of plankton populations in the northern Baltic Sea, respectively.

The focus of 2019 was on investigating changes in the seasonal patterns of zooplankton. We especially wanted to investigate, if the increasingly ice-free winters, have led to changes in spring emergence of zooplankton. If all species are not influenced in the same way, shifts in occurrence can, in worst case, lead to mismatch in seasonal timing between trophic levels.

In a second study, we wanted to see if we could find a connection between benthic fauna cladocerans and copepods by modeling their biotic interactions on annual scale. The background to this items from the laboratory, where previous studies have shown that benthic fauna, such as gammarids, can influence the emergence of zoo-



Selection of coastal copepods and cladocerans



plankton from resting eggs in the sediment.

Det huvudsakliga målet med mitt doktorandprojekt är att undersöka hur miljöfaktorer påverkar populationsdynamiken hos växt- och djurplankton. För ändamålet använder jag långa tidsserier, som jag analyserar med hjälp av populationsdynamiska modeller. Ett relaterat mål är att beakta möjliga felkällor som kan tänkas påverka observationsprocessen. Under 2019 har jag speciellt fokuserat på hur milda vintrar kan påverka tidpunkten för starten av säsongen hos djurplankton. Dessutom har jag undersökt möjliga interaktioner mellan bottendjur och djurplankton, eftersom bottendjur kan påverka förekomsten av djurplanktons viloägg i sedimenten.

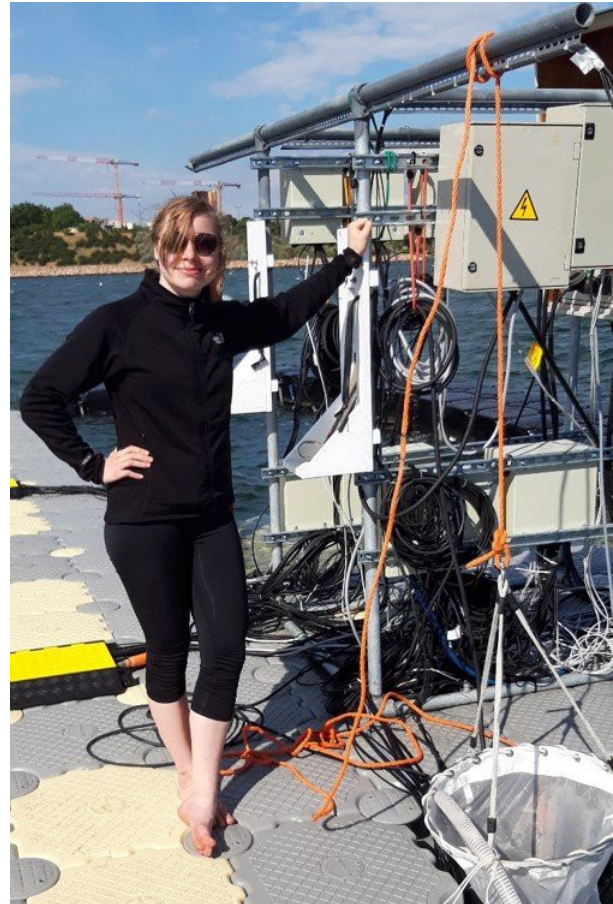
Biomarker and lipid profiles reveal salinity and warming induced forcing in marine zooplankton

Ella von Weissenberg, Anna Jansson, Jonna Engström-Öst

Ella von Weissenberg studies the effects of climate change on oxidative stress and reproduction in marine zooplankton, and she is funded by Onni Talas Foundation and Svenska kulturfonden.

During the first year of Ella's PhD at Novia she analysed biomarker samples collected during a combined field and experimental study at Tvärminne Zoological Station in 2018. The preliminary results show that elevated temperatures increase oxidative stress in *Acartia* copepods, which indicates a trade-off between oxidative stress and reproduction. During the summer, Ella participated in an international mesocosm experiment *Summer in spring* in Montpellier, funded by the Aquacosc network. Ella worked together with a Greek-Cypriot team and collected biomarker samples of the plankton community for oxidative stress analyses.

In August, Ella participated in the ESEB 2019 congress in Turku, where she presented a poster "*Trade-off between reproductive effort and oxidative status in marine zooplankton*", of which results she is currently preparing a manuscript to be submitted to an open-access journal.



Ella is ready to start the heatwave experiment in Sète, southern France.

Collaborators

- Mirella Kanerva (Ehime University, Japan)
- Kristiina Vuori (University of Turku)
- Tanya Zervoudaki and team (Hellenic Institute for Marine Research, Greece)
- Behzad Mostajir (Université de Montpellier France)
- Janne Søreide (University Centre in Svalbard Norway)

Ella von Weissenberg är inskriven som doktorand vid Helsingfors universitet och hon påbörjade sin avhandling 2019. Ella besökte Montpellier marina station i maj där hon deltog i ett experiment om värmebölja och effekter på plankton. Vidare har hon jobbat i Åbo universitets laboratorium och analyserat biomarkörer, samt deltagit i ESEB 2019 konferensen.



Svenska
kulturfonden



ONNI TALAAN SÄÄTIÖ

Waldemar von Frenckells stiftelse

Novel biomaterials derived from the lignocellulosic feedstock promoting sustainable development and environmental protection

Otto Långvik

The Novia Bioeconomy Research Team (NBRT) is an interdisciplinary research team. The contribution our group brings to the NBRT is characterised by a strong knowledge of synthetic, organic as well as materials chemistry, on a molecular level. The addition of these competences and combining them with the phenomena in the environment enables the development of interesting and beneficial research topic combinations within the NBRT.

We believe that our novel objectives and study topics will improve the knowledge of how specific biological systems work and function. This approach enables us to react to new challenges such as the reduction of climate change and the mitigation human impact on the environment. Further, our research explores and explains how novel bio-based materials can be utilised for environmentally benign applications.

One of the specific topics we study is the utilisation of lignocellulosic biomaterials and especially the wood derived hemicellulose fractions. The utilisation of these specific and well characterised lignocellulosic raw-material streams for new and sustainable applications, especially within the field of environmental protection, is a topic of great interest and possess a vast potential. One example of a new, interesting and promising biomaterial we have studied is the ga-

lactoglucomannan (GGM) hemicellulose originating from the soft wood timber, mainly spruce (*Picea Abies*). Notably, there are also several other interesting applications where the hemicellulose-based covalently cross-linked materials can be utilised.

One area we have enclosed in our work is to clarify to what extent chemicals, especially pharmaceuticals, are excreted from our industrialised societies to the surrounding environment at a local level. Initially we will conduct a detailed analysis of the local occurrences and concentrations of selected pharmaceutic compounds, both in surface waters and plankton populations. The second part of our work will focus on developing hydrogel-based materials which could be used as absorbents removing chemicals from the wastewater



Otto Långvik out sampling in the Svartå river autumn

streams. Our novel hydrogel materials are created by utilising a new and effective methacrylate functionalization of the GGM hemicellulose. Most of the methods for functionalization and co-polymerization of hemicelluloses, producing hydrogels, have turned out to be time and cost ineffective. Our recent results demonstrating a more straight forward and practical functionalization of the GGM using methacrylate anhydride at a controllable pH and temperature. Our results enable a simple, cost effective and scalable production of methacrylate functionalized GGM materials. The adsorption of other types of contaminants, such as heavy metals and other inorganic contaminants, from municipal, industrial and mining wastewaters will also be evaluated and investigated in our laboratory studies. The most promising materials, for removing pharmaceuticals and other organic micro-pollutants, will eventually be used and evaluated using field studies.

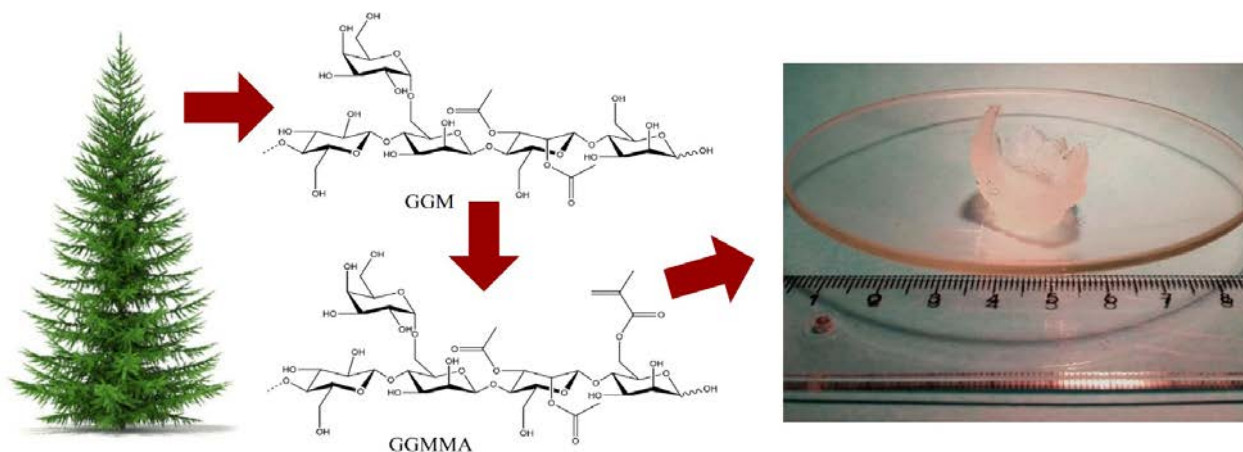
Furthermore, the group have been actively taking part in the education at Novia, organising seminars and meeting, publication activities and applying for external project funding. We have together with CH-Bioforce Oy initiated joint development projects. One example of these initiatives is a master's thesis with a focusing on the possible use of a hemicellulose fraction in

the production of specific and specialised multilayer composite products.

Ett av de aktuella forskningstema är att effektivt utnyttja olika vedbaserade, icke fossila, råmaterial för att på ett miljövänligt sätt framställa olika eftertraktade material. En av målsättningarna är att minska kemikaliseringsen av miljön och i ett inledande skede kommer vi att kartlägga förekomsten av läkemedelsrester i de lokala vattenmiljöerna samt bestämma i vilken utsträckning de individuella läkemedlen bioackumuleras från vatten till plankton. En betydande och väsentlig del av projektets verksamhet är fokuserat på att framställa nya hydrogelkompositer av lignocellulosa. Dessa nya biomaterial förväntas vara mycket lämpliga för vattenreningsapplikationer. Framställningen av dessa hydrogeler är en tillämpning av moderna bioraffinaderiprocesser som befrämjar Bio- och Cirkulär ekonomi.

Collaborators

- Patrik Eklund (Åbo Akademi University)
- Chunlin Xu (Åbo Akademi University)
- Lari Vähäsalo (CH-Bioforce Oy)



Otto Långvik is interested in developing new materials from the lignocellulosic feedstocks with a focus on the hemicellulose O-acetyl-galactoglucomannan (GGM). To the right you see a hydrogel made by copolymerizing methacryl acid with 10% methacryl functionalized galactoglucomannan (GGMMA).

Seizing bioeconomy opportunities in sustainable food developments

Ashkan Pakseresht

As a recently joined researcher to the Novia Bioeconomy Research Team (NBRT), I am studying bio-based economy. My contribution to the NBRT involve business research and economics with application to food, agriculture and natural resources. In particular, studying the consumer behaviour in adopting novel bio-based solutions. Consumer research is increasingly become important part of sustainable development.

My Main activities in 2019 included networking and development of research proposals. During this period, three main applications are being developed and soon will be submitted plus a granted research fund.

Proposal 1: "Consumer acceptance of meat alternatives: evidences from experiments"
Meat production has multiplied in the last 50 years which lead to ethical and environmental concerns and there is a need for other alternatives. The most important problem with commercialising of simulated meats (cultured meat and plants-based meat) is consumers' acceptance. Research findings revealed that there are various attitudes about cultured meat and some variables may impact on their acceptance. Review results indicated that factors such as public awareness, perceived naturalness, food neophobia, demographic factors, ethical concern, marketing factor (Price), other meat alternatives and cultural diversity affected on consumers' acceptance. We are aiming to develop a research proposal to investigate factors affecting consumer acceptance of cultured meat in Nordic countries. One review paper is being developed examining evidences from extant consumer research on acceptance of cultured meat.

Proposal 2: "Consumer Research with Big Data: Applications from the Food Demand Survey (FooDS)"
Market success of innovation in food production depends on the degree that it is



appreciated by consumers. This interest has led to a plethora of studies examining determinants of acceptance of novel foods, though, research demonstrated stakeholders often fail to predict which novel food ideas consumers truly appreciate. Previous research has detected a complex of various socio-economic, cognitions and technology-related factors predicting technology acceptance in the agri-food sector. While the existing literature offers a wealth of insights into food demand, due to its limitations, conventional research designs (i.e. survey, experiment, and focus group) are only able to include subset of determinants in their evaluation framework.

Moreover, most of the conventional studies focus on the consumer behaviour with a single point in time design. Recently, attention has been shifted towards "big data" (and replication studies) and how it

might yield new insights in understanding consumer demand and preferences. This research proposal aims to improve the determination of factors affecting consumer acceptance of novel food technologies by using merged large datasets of European national surveys and omnibus panels (e.g. Eurobarometer).

Numerous agri-food-technologies and innovations (e.g. gene editing, in-vitro meat, nano-encapsulation, and precision agriculture) are being developed to transform food production, improve productivity and foster sustainability. While there is growing eagerness to harness advances in data science and big data, there is however a problem of how to employ it when it comes to predict consumers acceptance of novel foods. The project consists of two distinct, but interlinked, work packages (WP). WP1 seeks to develop a meta model for evaluating big data in estimating consumer demand for technology-based food innovations. WP2 examines the relationships between latent variables affecting consumer acceptance of novel food based on the model developed in the WP1.

Proposal 3: contribution to the WP3 of the proposal developed at SLU Sweden "*Microbes for sustainable production systems*". Activity 3. "Consumer perceptions and marketability"

Successful development and commercialisation of any novel bio-based solutions requires social acceptance.

In addition, there is a disparity between experts and public perception of risk (or benefit). Microbiome engineering has the potential to support several broad sustainability objectives in food production, however, the ways that the technology and its implications might be perceived by consumers remains unclear.

We propose to hold a series of focus group discussions (consumers in major cities and in smaller towns as well as environmental or food advocacy groups), presenting short, general, and accessible explanations of microbiome engineering, including

potential benefits and tradeoffs for producers, consumers, and environmental impacts.

Research Granted: "*The Impact of Blockchain Technology on Swedish Food Supply Chain*"

The increasing interest of Blockchain technology in agriculture, calls for a clear understanding of its implications and challenges ahead. The first aim of this study is to synthesize the extant literature and put forward a practice-based view on an application of blockchain on food supply chain. The second aim of the project is to use empirical data derived from case studies to contribute to developing critical awareness of the implications of blockchain in the Swedish food context.

Forskningen inom biobaserad ekonomi fokuserar på näringslivsrelaterad forskning och ekonomi i relation livsmedel, lantbruk och naturresurser. Betydelsen av forskning i konsumentbeteende ökar och utgör en väsentlig del av hållbar utveckling. Som en del av detta studeras konsumenters beteende och intresset för att ta till sig nya bio-baserade lösningar. Projektansökningar är under arbete för forskning gällande konsumenters inställning till alternativ köttproduktion och för forskning inriktad på en ökad förståelse för efterfrågan på och preferenser för nya livsmedelsprodukter.

Collaborators

- Dr. Karin Hakelius, SLU Sweden
- Dr. Sina Ahmadi Sari University, Iran

Functional ecology and applications

Patrik Karell, Chiara Morosinotto, Katja Koskenpato (University of Helsinki), Ruslan Gunko, Kia Kohonen (University of Helsinki), Amandine Tooth (Lund University)

Our research group focusses both on fundamental questions dealing with the understanding of evolutionary adaptations to and demographic consequences of environmental change in natural populations, and on understanding the societal impacts of environmental variation and land use in an interdisciplinary framework. We collect and use individual-based field data from natural populations, and we use experimental set ups, citizen science data approaches, and surveys in our research. Currently our main financiers are the Academy of Finland, Kone foundation and Jenny and Antti Wihuri Foundation.

We have done a variety of investigations within the research group in 2019, with main focus on the tawny owl evolutionary ecology project and the LES-project dealing with interactions between land use, environmental (water) quality and human well-being.

The LES project: Ruslan finished the second part of his survey on life quality of inhabitants in Raseborg. He has also created detailed maps of land use and water quality in the region, which he is combining with the survey data. With these data, Ruslan will be able to link the quality of the coastal waters with land use and combine this information to the perceptions of environmental quality and life satisfaction of the inhabitants.

The Tawny owl project: Chiara has analysed blood samples of tawny owls and produced a large and interesting data set on telomere dynamics from offspring to adulthood in the lab in Lund University. With these data we are able to explore the molecular dynamics of the different life history syndromes of the tawny owl morphs. The results suggest that the physiology of the morphs differ all the way down to the molecular mechanisms in the cells and that these differences become pronounced as they reach adulthood.

Katja went on maternity leave in summer after finalizing the publication of the second paper of her PhD at University of Helsinki. The paper shows that snow conditions differently affect the conspicuousness of grey and brown tawny owls. Before her



A brown male tawny owl from Ingå.

leave, she also analysed data on colour morphs of museum skin specimen from around Europe. The results show that the grey morph is more common in dry and cold areas whereas the brown is more common in wet and warm environments with large scale variation in their frequency across the species distribution. Patrik has continued to analyse and write up these results and presented the study in Naples at the Italian Ornithological Congress.

There have been two MSc-students in the group during 2019. Kia finished her Master's thesis and graduated from University of Helsinki in summer 2019. In her thesis she investigated prey choice of the tawny owl

morphs and found that the brown morph is more flexible in its prey choice than the grey morph. If the vole abundance (the main prey of tawny owls in Finland) is low, the brown morph switches to eat small birds whereas the grey one is more strict on voles in its diet. This difference between morphs may have implications for how the morphs cope with changes in the environment. Amandine Tooth did her MSc at Lund University in our group on sex ratio adjustment in tawny owl colour morphs. Her results highlight the different life history strategies of the colour morphs.

In the end of the year we planned and started a field experiment where we are studying how small birds detect and mob the colour morphs in winter time.

Collaborators

- Lund University, Sweden: Prof. Staffan Bensch & prof. Jan-Åke Nilsson
- Novia UAS: Senior Lecturer Patrik Byholm, Dr. Jonna Engström-Öst, Dr. Andreas Lindén
- University of Turku: Prof. Jon E. Brommer, Univ. Lecturer Timo Vuorisalo
- University of Helsinki: Dr. Aleksi Lehikoinen, Univ. Lecturer Hannu Pietiäinen & Dr. Jari Valkama, Dr. Daniel Burgas, Dr. Matias Scheinin
- University of Lausanne, Switzerland: Prof. Alexandre Roulin
- Åbo Akademi University: Univ. Lecturer Markus Öst, Doc. Lauri Rapeli
- University of Oulu: Assoc. prof. Heikki Helanterä
- University of Jyväskylä: Dr. Carita Lindstedt-Kairaksela



Museum skins of grey and brown tawny owls. We have collected data from many different Zoological musea around Europe to study the spatial and temporal distribution and relative proportions of the grey and brown tawny owls throughout its range distribution. These tawny owl skins (three grey and three brown) are from Moscow

I vår forskningsgrupp försöker vi förstå processer i naturen på olika plan genom att studera olika modellsystem. Hur anpassar sig organismer till förändringar i miljön och vilka är urvalsprocesserna? Vi strävar även till att tillämpa data och resultat från dessa projekt med samhällsekonomiskt relevanta frågeställningar där vi kopplar ihop ekologiska data med kvantitativa surveyundersökningar. I hur stor utsträckning kan man avverka skog utan att utarma biodiversiteten och ekosystemtjänster och finns det lönsamhet i en sådan ekologiskt hållbar strategi? Vilken betydelse har närmiljöns vattenkvalitet för människors välbefinnande och hur påverkar olika typer av markanvändning belastningen i kustvattnen?



Mobbing experiment in the field. Small birds group together to mob predators such as tawny owls as soon as they discover them. We are studying this mobbing behaviour of small birds in winter with detailed behavioural observations in the field. The aim is to measure how fast they detect the brown and grey tawny owl morphs depending on the snow conditions and how aggressive they are towards them. We use stuffed grey and brown tawny owl mounts in our experimental set ups. The pictures present two examples from the field sites in Ingå. The stuffed owls are highlighted.

Ecophysiological adaptations to climate change

Chiara Morosinotto, Patrik Karell

Throughout 2019 I worked as postdoctoral researcher within the project led by Dr. Patrik Karell on evolutionary dynamics under environmental change. During this year I visited the Department of Biology at Lund University (Lund, Sweden) to conduct laboratory analyses on the telomere dynamics of a color polymorphic species, the tawny owl (*Strix aluco*), which is characterized by a genetically determined grey or brown-reddish color morph.

Telomeres are useful molecular biomarkers of aging and condition. Previous studies conducted by Dr. Karell and colleagues showed that adults with brown morph have shorter telomere during their adult life than adults with grey morph. I wanted to investigate whether this difference is morph-specific throughout individual life, and thus if it present already in hatchlings and nestlings, and if it is inherited and dependent on parental traits. To achieve this goal, I extracted the DNA from over 500 blood samples of both parents and offspring collected between 2009 and 2019 and I measured the telomere length using qPCR method. Two manuscripts are currently under preparation from these results.

While in Lund, I co-supervised the MSc thesis of Amandine Tooth (MSc in Evolutionary Ecology, Lund University), investigating sex-ratio dynamics in tawny owls depending on parental color morph and offspring condition. I helped Amandine throughout her work in the lab, from extracting the DNA to performing the offspring molecular sexing using PCR method. Amandine will defend her thesis in January 2020 and a manuscript will result from her thesis work.

Throughout 2019 I was invited to be a member of the scientific committee of the XX Italian Ornithological Congress that was held in Naples in September. My tasks were to help organizing the scientific programs, organizing symposiums and sessions, evaluating the submitted abstracts as well as translating all the official communications to



Chiara with a newly ringed tawny owl nestling

English. During this congress I also organized a symposium "Birds of prey in a changing world" and there I presented a work investigating offspring condition and recruitment probability according to parental color morph; a manuscript is currently under review. I was also contacted by Federico Cauli, author of a popular science book about owls. Him and his collaborators were interested in having a chapter on how to conduct scientific research with owl species and chose our research group as an example. The book

should be published in 2020.

Finally, during this year I also collaborated to a project, led by Dr. Patrik Karell, on tawny owl cavity choice depending on predation risk, which was accepted for publication in December 2019. During the spring I continued to help collecting data on tawny owl life history traits and samples of plasma and blood cells, currently being analyzed by our collaborators Dr. Suvi Ruuskanen and Dr. Antoine Stier from Univ. of Turku (Finland), to measure thyroid hormones, mitochondrial activity and oxidative stress in tawny owls. Finally, this autumn I helped to plan an experiment to investigate passerines mobbing intensity according to tawny owl color morph in different snow condition. From February 2020 I will cosupervise the thesis of Charlotte Perrault on this experiment.

In addition to this main tawny owl project, I continued my collaboration with the University of Turku to study winter population dynamics of pygmy owls, within the PhD project of MSc Giulia Masoero, and maternal effects in pied flycatchers, resulting in a published paper in 2019 and one accepted in early January 2020. In collaboration with the Finnish Natural History Museum I also joined a project led by Dr. Andrea Santangeli on flying squirrel stress response to habitat structure and conspecific density. I also continued my collaboration with the University of Padova (Italy), started



Tawny owl nestling almost ready to fledge

in 2017 thanks to the L'Oreal Italia and Unesco "For Women in Science" award, to investigate the impact of predation risk and maternal stress on offspring behaviour and telomere dynamics and two papers were under review during 2019.

Collaborators

- Lund University (Sweden): Prof. Staffan Bensch and prof. Jan-Åke Nilsson
- University of Turku (Finland): Dr. Suvi Ruuskanen, Dr. Antoine Stier, Prof. Erkki Korpimäki, Prof. Toni Laaksonen, MSc. Giulia Masoero, Dr. Elina Koivisto
- University of Cape Town (South Africa): Dr. Robert L. Thomson
- Instituto de Investigación en Recursos Cinegéticos (Spain): Prof. Rafael Mateo
- University of Padova (Italy): Prof. Andrea Pilastro, Dr. Silvia Cattelan, Dr. Alessandro Grapputo, Prof. Matteo Griggio

Jag jobbar som post dok forskare i Patrik Karells akademiforskarprojekt om eko-evolutionär dynamik i respons till miljöförändringar med fokus på kattugglan. Under 2019 besökte jag Biologiska institutionen vid Lunds universitet i Sverige, där jag gjorde laboratorieanalyser av DNA prov från 100-tals kattugglor. Med analyserna undersöker vi cellernas åldrande och hur detta återspeglas i individens evolutionära duglighet. Jag handledde en magisteravhandling vid Lunds universitet om faktorer som påverkar könskvotsjusteringar i kattugglans kullar. Jag har varit involverad i många delstudier inom projektet under året: förutom skriv- och analysarbete med cellåldrandet (telomerlängd) har jag samlat in och organiserat fysiologiska prov från fält som analyseras i Åbo universitet, varit medförfattare i en nypublicerad studie där vi undersöker hur äggpredation påverkar valet av häckningsplats, samt i planeringen och utformandet av ett beteende-ekologiskt experiment som utförs under vintern 2019-20.

LES: Life quality in Raseborg

Ruslan Gunko, Patrik Karell, Lauri Rapeli (Åbo Akademi University), Timo Vuorisalo (University of Turku) and Matias Scheinin

LES is a simple acronym meaning Linking Environment and Society, which itself describes the main idea of the project. This is a PhD project executed at Novia and University of Turku in collaboration with Åbo Akademi University.

LES is an interdisciplinary project aiming to link objective environmental data of coastal waters and subjective survey data on a local scale. Therefore, the research team consists of a wide expertise in both environmental and social sciences.

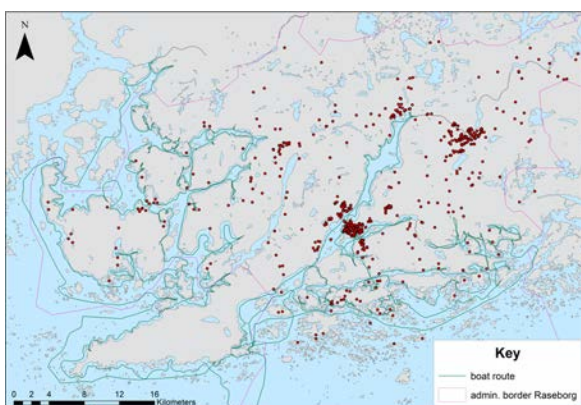
In 2019 we collected objective environmental data in Raseborg archipelago. It is consisting of unique records of water quality parameters: water temperature, conductivity, turbidity, pH, dissolved organic matters, dissolved oxygen and total algae data. Simultaneously we have done spatial analysis of land-use data and non-point pollution risk in order to find risk zones which require meticulous attention.

The main sociological features of the project are the subjective data collected by surveying people in the study area. This work was successfully finished in 2019. The survey data consist of the subjective opinions of people about water quality and life satisfaction together with socio-demographic parameters like age, education, relationship with property, etc. Our plans for 2020 is to link objective data to people's

opinion and understand people's ability to assess water quality and factors affecting it. Moreover, we are aiming to test the importance of water quality for the life quality on a local scale.

The results of the LES project will provide potential solutions for mitigating climate change effects on a local scale through changes in land use practice. Additionally, our goal is to understand the societal importance and economic benefits of ecologically sustainable development in the region. Finally, we are expecting to develop framework for policymakers in Raseborg, which can be modified according local features and used in different regions around all Finland.

LES är ett fyraårigt tvärvetenskapligt doktorandprojekt som utförs vid yrkeshögskolan Novia och Åbo universitet. Projektet kopplar ihop detaljerade mätningar av vattenkvalitet och avrinningsdata i Raseborg med enkät-undersökningar av orsbsbefolkningen för att förstå betydelsen och uppfattningen av miljöns tillstånd för välbefinnande på ett lokalt plan.



Study area with mapped survey answers



Ecology of forest raptors and archipelago birds

Patrik Byholm, Martin Beal (Lund University & ISPA - Instituto Universitário), Julia Gómez-Catasús (University of Madrid), Caroline Howes (University of the Witwatersrand), Wouter Vansteelant (University of Amsterdam)

We study the population and conservation biology of forest raptors and the Caspian tern. By combining traditional field work with new technology and statistical modelling, we aim to get better understanding of species' movement ecology, habitat use and factors limiting their distribution. How does individuals utilize their home range, how does environmental affect species performance and distributions?

Highlights of the year

As a result of the ongoing work, we in 2019 published work showing that the distribution of European honey buzzards (*Pernis apivorus*) on the African wintering grounds has been pushed southwards during the last decades. This coincides with an increase in forest loss further north in Africa, which is the



Honey buzzards are at risk of returning too late in Finland for breeding if the wintering quarters are located far in Southern Africa. Here an adult male on return migration caught on photo at the south coast of Finland in May 2012.

area where the species traditionally has been spending the boreal winters. To what extent a more distant wintering location may result in delayed arrival on the breeding grounds more generally and subsequently lower reproductive performance is still largely unknown. However, from birds tagged with GPS-trackers we have found that late arrivals on the Finnish breeding grounds often result in the breeding event being skipped. Thus, to the extent a more distant wintering location results in later arrivals on the breeding this may have negative consequences for population

development. Caroline Howes successfully defended the PhD-thesis and got her PhD-degree in late 2019. Together with Wouter Vansteelant the ontogeny of migration at the individual level among a set of honey buzzards equipped with GPS- trackers as juveniles and transiting into adulthood during 2011-2019 continued. New collaboration on the same topic was initiated with Elham Nourani and Kamran Safi.

Julia Gómez-Catasús visited Finland in late 2019 when she worked on developing an ABC- model (stands for approximate Bayesian computation) understanding the population dynamics of the Baltic Sea population of Caspian terns (*Hydroprogne caspia*). A manuscript with Martin Beal as first author presenting parts of his MSc-thesis was compiled and sent in for possible publication In this work, we show, among other things, that Caspian terns although breeding in colonies largely have individual foraging areas and that there is little change over time what comes to their geographical location within the breeding season.



On July 7th 2019 two adult sea eagles wiped out colony of 40-50 breeding pairs of Caspian terns in less than one hour by predated on fetuses from eggs and newly hatched chicks.

The field work at the Finnish west and south coasts continued intensively: breeding success was monitored, birds were caught to be deployed with GPS-trackers and remotely operated camera-surveillance was used to monitor colony activities. In 2019 the camera surveillance could, among other things, in detail document the predation of white-tailed sea eagles on breeding terns.

Under det gångna året kunde vi rapportera om utbredd förekomst av neonikotinoider - en grupp pesticider vida använda inom jord- och skogsbrukssektorn - i blodet hos finländska bivråkar. År 2019 publicerade vi ett arbete som visar att bivråkars övervintringsområde i Afrika har skjutits söderut under de senaste decennierna. Detta sammanfaller med en ökad skogsförlust längre norrut i Afrika, som är det område där arten traditionellt har tillbringat de boreala vintrarna. I den utsträckning en mer avlägsen övervintringsplats resulterar i senare ankomster på häckningsområdet och detta igen leder till missade häckningsmöjligheter undersöks. Arbetet med att studera hur bivråkars migration förändras med att de åldras intensifierades. Modelleringen av skräntärnors populationsdynamik framskred. Ett manuskript var vi visar att skräntärnor har mycket individuella furageringsområden även om de häckar i en och samma koloni sändes in för publicering. Med hjälp av den kameraövervakning som användes för att övervaka aktiviteterna i skräntärnekolonier kunde vi år 2019 i detalj dokumentera hur predationen utförd av havsörn går till.

Collaborators

- Susanne Åkesson (Lund University, Sweden)
- Andrea Santangeli (University of Helsinki)
- Willem Bouten, Wouter Vansteelant (University of Amsterdam, The Netherlands)
- Kouze Shiomi (National Institute of Polar Research, Japan)
- Elham Nourani, Kamran Safi (Max Planck Institute of Animal Behavior, Germany)
- Ulrik Lötberg (BirdLife Sweden)
- Otso Ovaskainen (University of Helsinki)
- Antti Below (Metsähallitus)
- Sanna Mäkeläinen (University of Helsinki)
- Craig T. Symes (University of the Witwatersrand, South Africa)



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Waldemar von Frenckells stiftelse

Statistical population ecology

Andreas Lindén, Louise Forsblom (Åbo Akademi), Andreas Otterbeck, Julien Terraube, Henry Hägerstrand

Our aim is to produce sound scientific knowledge on questions related to population ecology and biodiversity, to support sustainable development. We do basic and applied research, using effective analytical methods that provide unbiased quantitative answers.

The research activity of the Statistical Population Ecology group (SPoEc) was diverse, including studies on population dynamics (plankton, birds and theory), Whitefish population structure at Åland Islands, Cormorant movement ecology and choice of fishing habitat, bird phenology and breeding ecology. The research focused on aquatic systems and included everything from merely theory, to applied research in the core of the framework of bioeconomy.

SPoEc was in a leading role in two research projects related to fisheries research: the Åland Whitefish project (Lindén, Hägerstrand, Otterbeck) and the Great Cormorant project in the Gulf of Finland (Patrik Byholm, Lindén, Terraube). Both were jointly funded by the EU and national funding sources. Descriptions of these projects can be found in separate sections of this report (Whitefish project on p. 21; Cormorant project on p. 22).

Andreas Otterbeck, who has worked in e.g. the whitefish project, stated his PhD-project about climate responses of birds with

different migration strategies. PhD-candidate Louise Forsblom, on the other hand, got her thesis finished by the end of the year and submitted it in early 2020.

The Statistics Helpdesk is a free voluntary service ran by SPoEc (Lindén). Novia's students, teachers, researchers and project personnel may visit the helpdesk in order to discuss statistical problems, e.g. what type of analysis is appropriate for a particular question with a particular dataset.

Vi studerar frågor inom populationsekologi och biodiversitet, med syftet att bidra till en kunskapsbaserad hållbar utveckling. Med statistisk analys får vi tillförlitliga kvantitativa svar på både tillämpade och mera teoretiska frågor. Årets forskning handlade om populationsdynamik (plankton, fåglar, teori), sikens populationsstruktur på Åland, storskarvens rörelser och val av fiskehabitat, fåglars fenologi och häckningsbiologi. Gruppen deltog i ledandet av två EU-finansierade tillämpade forskningsprojekt (se skilda beskrivningar av projekten om sik och skarv).

Collaborators

- Aleksi Lehikoinen, Sara Fraixedas, Markus Piha, University of Helsinki, Finland
- David Gilljam, Marianne Mugabo, Steven M. Sait, University of Leeds, U.K.
- Jonas Knape, Swedish University of Agricultural Sciences, Sweden
- Jonna Engström-Öst, Patrik Karell, Mikael Kilpi, Novia UAS, Finland
- Mikael Himberg, Mikael von Numers, Tom Wiklund, Christine Engblom, Jan-Olof Lill, Åbo Akademi University, Finland
- Mike S. Fowler, Swansea University, U.K.
- Sirpa Lehtinen, Maiju Lehtiniemi, Finnish Environment Institute, Finland



Theoretical population dynamics helps to understand why species become threatened. The Ruff (*Calidris pugnax*) was a fairly common breeding bird in Finland but is nowadays critically endangered, mainly due to the disappearance of suitable habitats. Photo: Andreas Lindén

The Whitefish on Åland Islands – spawning grounds and origin

Andreas Lindén, Henry Hägerstrand, Andreas Otterbeck

Novia led a project (August 2018–November 2019) studying the status of the Whitefish spawning on the Åland Islands. Our aim was to describe and map the spawning grounds of Whitefish on Åland and to unravel the origin of the fish. This is important for maintaining a sustainable fishery of Whitefish on the Åland Islands.

The project was funded by the European Maritime and Fisheries Fund (EMFF) and the Government of Åland. Two project researchers – Henry Hägerstrand and Andreas Otterbeck – were employed within the project.

The most active local practitioners of Whitefish fishery were interviewed on their thoughts about the state of Whitefish at Åland. Further, 160 individuals of Whitefish were acquired from traditional spawning sites on the Åland Islands for measuring the number of gill rakers, length and weight. Also, Whitefish fry from Guttorp hatchery were acquired. Some of the Whitefish caught at spawning time on Åland were subject to otolith analysis, revealing that part of the fish was raised at hatcheries.

Using a statistical method developed during this project, we analyzed an earlier collected

data set of gill raker counts from 709 Whitefish sampled during the summer (outside the spawning season). We found that river spawning whitefish dominated the catches, however, with a proportion decreasing throughout the summer. We also estimated the proportion of a form of Whitefish spawning in some bays around Mariehamn, possibly originating in hatchery-raised fish. We concluded that 0–6 % of the Whitefish caught in summer consist of this form but showed that the proportion may be higher locally.

Detta av Novia ledda forskningsprojekt påbörjades 2018 och avslutades i november 2019. Syftet var att beskriva och kartlägga den åländska sikens lekplatser, samt klargöra fiskens ursprung. Ett ytterligare delmål var att granska den utanför lektid fångade sikens ursprung. Denna information behövs för att förstå den åländska sikstammens tillstånd och betydelse för ett fortsatt hållbart fiske av sik på Åland.

Under projektet intervjuades betydande utövare av sikfiske på Åland. Sampel på 160 individer lekande sik, samt yngel från Guttorp fiskodlingsanstalt, införskaffades för biometrisk analys. Även otolialanalys utfördes på sik som fångats lektid på Åland. Dessutom vidareutvecklades statistiska metoder för analys av proportionen älv- och havslekande sik på basis av gälträfständernas antal. Metoden och dess resultat publicerades i tidskriften *Boreal Environment Research*.



The Whitefish is an economically important species, and the main target from many professional fishermen. Photo: Henry Hägerstrand

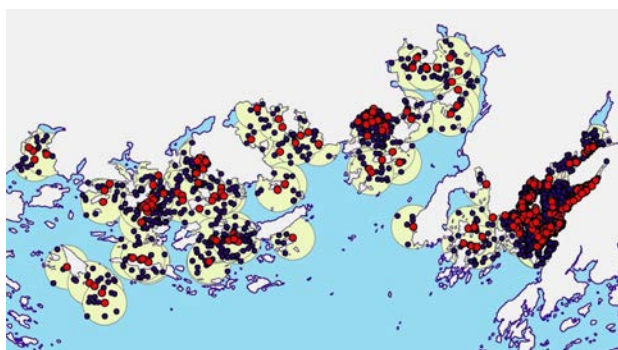
The great cormorant project

Patrik Byholm, Andreas Lindén, Julien Terraube-Monich, Laura Montin

The main goal with the project is to get a better picture of the possible local effects of great cormorants (*Phalacrocorax carbo sinensis*) on fish stocks in the Gulf of Finland.

The project is funded by the European Maritime and Fisheries Fund (EMFF) and national funding, through Etelä-Suomen kalatalousryhmä (ESKO), the ELY-centre of Southwest Finland and Svenska Kulturfonden.

As a first step towards elucidating the main objective, cormorants were tagged with GPS-trackers in 2019 along the Finnish south coast to amass data for constructing a model on how cormorants choose their fishing waters. In total, 14 breeding adult birds were caught during May and June. The preliminary analysis of this material has revealed, among other things, that great cormorants usually fish within a distance of less than 10 km from the breeding colony/night roost, that they strongly prefer shallow water (close to land) which is exposed to waves. Somewhat surprisingly, the trackers



The observed fishing places (red dots) of the cormorant "Urho" and pseudoabsences (blue dots) generated within 1 km (yellow buffer) of the actual fishing place.



A great cormorant trapped and equipped with a GPS-tracker fisherman.

revealed that cormorants sometimes also fish during night and at depths over 10 m.

Huvudmålet med skarvprojektet är att få en bättre bild av de lokala effekterna av mellanskarvars möjliga inverkan på fiskbestånd i Finska viken. Som ett första steg mot att belysa huvudmålet sattes GPS-sändare på 14 skarvar längs den finska sydkusten sommaren 2019. De preliminära analyserna av detta material har, bland annat, avslöjat att Finska vikens mellanskarvar vanligtvis fiskar inom ett avstånd av mindre än 10 km från häckningsön, att de prefererar grunt vatten (nära land) var vågexponeringen är stor.

Collaborator

- Pekka Rusanen (SYKE)



Svenska
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Elinkeino-, liikenne- ja
ympäristökeskus



Teaching

The members of the research team contributes to the education at Novia University of Applied Sciences. Here is an overview of our teaching activities in 2019



Students during study visit at LUVY (Länsi-Uudenmaan vesiyhdistys - Västra Nylands vattenskyddsförening). Photo: Jonna Engström-Öst

Jonna Engström-Öst

- Coastal ecology I (field course at Tvärminne Zoological Station)
- Conservation Biology (course coordinator, course teacher)
- Monitoring of Aquatic Bodies
- Research Methodology
- Sustainable Coastal Management (workshops)
- Supervising PhD, MSc- and BSc-thesis projects

Anna Jansson

- Sustainable Coastal Management
- Conservation Biology
- Monitoring of Aquatic Bodies
- Supervising BSc-thesis projects

Otto Långvik

- Bioeconomy Innovation
- Supervising BSc-thesis projects

Andreas Lindén

- Conservation Biology (course teacher)
- Statistics (course teacher)
- Fisheries Resource Management
- Supervising PhD, MSc- and BSc-thesis projects
- Organises statistics helpdesk for students and staff at Novia

Publications

Scientific articles

Byholm P, Gunko R, Burgas D & Karell P Losing your home: temporal changes in forest landscape structure due to timber harvest accelerate Northern goshawk (*Accipiter gentilis*) nest stand losses. *Ornis Fennica*, In press.

Daiping, W, Valcu M, Dingemans N, Bulla M, Both C, Kempenaers B, Duckworth R, Drummond H, Karell P, Albrecht T, & Forstmeier W (2019) Scrutinizing assortative mating in birds. *PLoS Biology*, 17(2): e3000156. <https://doi.org/10.1371/journal.pbio.3000156>.

Engström-Öst J, Glippa O, Feely RA, Kanerva M, Keister JE, Alin SR, Carter BR, McLaskey AK, Vuori KA & Bednaršek N (2019) Eco-physiological responses of copepods and pteropods to ocean warming and acidification. *Scientific Reports* 9: 4748

Forsblom L, Engström-Öst J, Lehtinen S, Lips I & Lindén A (2019) Environmental variables driving species or genus level changes in annual plankton biomass. *Journal of Plankton Research* 41: 925-938

Forsblom L, Lehtinen S & Lindén A (2019) Spatio-temporal population dynamics of six phytoplankton taxa. *Hydrobiologia* 828: 301-314

Howes C, Symes C & Byholm P (2019) Evidence of large-scale range shift in the distribution of a Palaearctic migrant in Africa, *Diversity and Distribution*, 25: 1142-1155.

Karell P, Ericsson P, Morosinotto C, Ericsson D, Haglund K & Nilsson L.-O. Mammalian nest predation induces nest site switching in territorial tawny owls (*Strix aluco*). *Ornis Fennica*, In press.

Koskenpato K, Lehikoinen A, Lindstedt-Kareksela C & Karell P. Grey tawny owls are more cryptic than brown ones in snowy landscapes in a resident colour polymorphic bird. *Ecology and Evolution*, In press.

Kuismanen L, Forsblom L, Engström-Öst J, Båmstedt U & Glippa O. Salinity effects on copepod egg production, hatching and survival. *Crustaceana Monographs*. In press.

Meysick L, Ysebaert T, Jansson A, Montserrat F, Valanko S, Villnäs A, Boström C, Norkko J & Norkko A (2019): Context-dependent community facilitation in seagrass meadows along a hydrodynamic stress gradient. *Journal of Sea Research* 150-151: 8-23

Morosinotto C, Thomson RL, Korpimäki E, Mateo R & Ruuskanen S (2019) Maternal food supplementation and perceived predation risk modify egg composition and eggshell traits but not offspring condition. *Journal of Experimental Biology* 222: jeb201954.

Santangeli A, Wistbacka R, Morosinotto C & Raulo A (2019) Hair cortisol concentration in Siberian flying squirrels is unrelated to landscape and social factors. *The Science of Nature* 106:29

Publications (cont.)

Popular articles

Byholm P (2019) Skräntärnan speglar en skärgårdsnatur i förändring. Skärgård 42: 78-85.

Newspaper columns

Engström-Öst J. Bli en trädkramare. Västra Nyland, 29.10.2019.

Karell P. Naturligt urval och geografiska färgmönster. Västra Nyland. September 2019.

Karell P. Åldrandets ekologi. Västra Nyland. February 2019.

Conference presentations

Byholm, P. Merimetson paikallisvaikutukset kalakantoihin Suomenlahdella, Suomen merimetsotyöryhmän kokous, 22.10.2019.

Byholm, P. Mitä uutta voi oppia räyskästä neljässä vuodessa kun apuna GPS-paikantimia ja valvontakameroita? Helsingin Seudun Lintutieteellinen Yhdistys, 7.3.2019.

Engström-Öst J. Eco-physiological responses in copepods and pteropods to ocean warming and acidification. Oikos Finland Conference for Ecologists and Evolutionary biologists, Uleåborg, 5-6.2.2019.

Engström-Öst J. Eurytemora affinis in the western Gulf of Finland - responses to environmental change. Use of molecular-genetic and morphological methods to study the taxonomy, phylogeny, biogeography, and ecology of Eurytemora species, St. Petersburg, Russia, 13-17.5.2019.

Engström-Öst J. Hur ser Östersjöns framtid ut? Blue bioeconomy, Campus Raseborg, Ekenäs, 28.2.2019.

Engström-Öst J. Läget i Östersjön - najs eller bajs? Baltic Sea-friendly food - kick-off day at Mikaelsskolan, Ekenäs, 30.8.2019.

Engström-Öst J, Almén AK, Jansson A, Tamelander T. Status of OA research in Finland. BALSAM meeting, Göteborg, Sweden, 10.10.2019.

Engström-Öst J. Östersjön i fokus - läget nu och i framtiden. R&D days, Novia UAS, Vasa, 3-4.4.2019.

Forsblom L. Accounting for observation error in plankton observations on an intra annual scale to facilitate interannual analysis (Poster presentation). Oikos Finland Conference for Ecologists and Evolutionary biologists, Uleåborg, 5-6.2.2019.

Forsblom L. Accounting for observation error in plankton observations on an intra annual scale to facilitate interannual analysis (Poster presentation). FINMARI meeting, Helsingfors, 26.2.2019.

Jansson A, von Weissenberg E, Engström-Öst J. Biomarkörer som indikatorer på klimatförändringens inverkan på djurplankton (Poster presentation). R&D days. Novia UAS, Vasa, 3-4.4.2019.

Jansson A. Introduction to ocean acidification. BALSAM meeting, Göteborg, Sweden, 10.10.2019.

Publications and media appearances

Karell P. Climate change and tawny owl colour polymorphism: from selection processes to changing large scale geographical patterns. XX CIO, Italian Ornithological Congress, Napoli, Italy 26-29.9.2019.

Karell P. Gloger's rule on the move: climate change alters the distribution of colour polymorphism in a wild bird. Evolutionary Ecology unit at Lund University Christmas meeting, Örenäs slott, Landskrona, 16-17.12. 2019.

von Weissenberg E. Spatial structures of a high-Arctic macrozooplankton community. Novia Research Seminar, Campus Raseborg, Ekenäs 25.4.2019.

von Weissenberg E, Jansson A, Vuori K, Engström-Öst J. Trade-off between reproductive effort and oxidative status as a response to warming in the marine environment (Poster presentation). European Conference of Evolutionary Biology, Åbo, 19-24.8.2019.

Media appearances

Patrik Byholm

YLE, news (GPS-tracking of migratory birds, web-news interview)

31.12.2019, <https://yle.fi/uutiset/3-11126627>

Svenska YLE, Spotlight (great cormorant nesting numbers, TV-interview)

4.11.2019; <https://areena.yle.fi/1-4587412>

Ilkka (Forestry and nature values, newspaper interview)

Vasabladet (great cormorants and sea eagles, interview)

2.08.2019; <https://www.vasabladet.fi/Artikel/Visa/305577>

MTV3 (honey buzzard migration, interviews)

25.04.2019; <https://www.mtvuutiset.fi/artikkeli/mtv-uutisten-kummilinnun-paivi-haukan-lahetin-on-vaiennut-kuudessa-vuodessa-lintu-ehdi-hammastyttaa-tutkijoita-monta-kertaa/7377622>

8.05.2019; <https://www.mtvuutiset.fi/artikkeli/mtv-n-kummihaukka-paivi-teki-comebackin-jo-kerran-vaiennut-lahetin-herasi-yllattaen-eroon/7396514#gs.0iyh5k>

Jonna Engström-Öst

Radio Vega Västnyland (Blågröna alger finns i Pojoviken, men de trivs inte och vägrar att blomma)

31.07.2019; <https://svenska.yle.fi/artikel/2019/08/04/blagrona-alger-finns-i-pojoviken-men-de-trivs-inte-och-vagr-ar-att-blomma>

Research and Development in Bioeconomy 2019

Marianne Fred

In Bioeconomy the year 2019 was full of “Hello-Goodbyes”. Many projects that had been running since the beginning of the EU-programperiod 2014-2020 were ending and some that were planned to go on until the end of the programperiod were starting up. Starting up new projects is always exciting and rewarding, since the planning period easily can stretch over several years. A positive financing decision also brings about an organising frenzy and the project takes a jump from passive waiting for a decision to going full speed ahead overnight. At the same time projects that are ending are tying up loose ends and synthesising the outcomes of the project from years back, contemplating what could have been done differently, what was achieved, and what the next steps could be. It makes for a very dynamic atmosphere and no day is like the other at work. It also means we need very good routines and coherence in our work to be able to pick up where we left in some cases, and in other cases shift gear and start new processes like recruiting, setting up a projects infrastructure and informing our organisation and the world around us about what we have been financed to do.

I would like to dedicate the introduction to the research report 2019 on my behalf, to everybody working with the infrastructure that support our project activities. An important infrastructure is administration and management that support researchers and project personnel, allowing them to focus on substance rather than figuring out where Annex 6 in the Interreg application went, or how a report should be filed in one of the numerous electronic funding-systems. Reminding about the importance of putting logos on everything and getting signatures on attendance lists. Updating the economic follow-ups of the projects budget and flagging potential



problems before they grow.

Information and communication is very important to projects in today's world and it needs skill and knowledge to do it right. A good project reaches out and shares its' results with stakeholders out there. Getting media attention and coverage is essential for future funding, networking and credibility. Luckily, we have people working at Novia UAS with exactly that and even a designated person working with communicating Research and Development. In 2019 Novia launched a platform for communicating R & D called Novialia where everyone in the organisation can tell about their work, students can blogg about their projects and communication becomes low threshold and part of any R & D project or study at Novia UAS. Besides being a nice place to read about the many things being done at Novia it also connects people and makes us more aware of our own organisation and the people working here.

I also want to bring up teaching as an extension of R&D and the possibilities it brings for reaching out with results from

Novia Raseborg R&D Applied projects

research and development projects. In 2019 we have started teaching a course on Permaculture and regenerative agriculture. The course is hybrid in that it is digital and virtual with a few seminars IRL. The topic of the course has been raised in our projects on sustainable food systems and the format of the course makes it available anywhere. Novia UAS curate the teaching and the expertise in the course comes from within the Nordic countries. The format seems to work very well, we are very pleased with how the course is going and the students seem to be having fun. The students are mostly working or studying full time and taking our course on the side. Most students in the course have a University degree already. Most importantly we have been able to form community using a format of digital communication and virtual studies. I can recommend this as a way of communicating results and having fun, of course!

Under 2019 har forskning och utveckling kännetecknats av att projekt som startade i början av EU-programperioden 2014-2020 har avslutats, och andra som pågår ända in i 2021, har påbörjats. Infrastrukturen som stöder vår projektverksamhet är en doldis som inte syns då projekten presenteras eller resultat visas upp, men som har en viktig stödande funktion och möjliggör att projektverksamheten kan fokusera på utveckling hellre än administration. YH Novia har gjort medvetna satsningar på att ha fungerande projektadministration och koordinerande stödfunktioner för att kunna fungera som en trovärdig och pålitlig projektpartner och huvudman. Projektpersonalen får stöd med ekonomisk uppföljning, rapportering och ansökningar samt kommunikation. YH Novia har redan några år haft en kommunikatör specifikt för forskning och utveckling och 2019 lanserades kommunikationsplattformen Novialia (<https://www.novia.fi/novialia>) för publikations- och produktionsverksamheten på Novia. Att kommunicera resultat är minst lika viktigt som att ta fram nya resultat. Att samla kommunikationen från forskning och utveckling på ett och samma ställe ger så väl världen utanför ett fönster in i vår verksamhet som oss själva en möjlighet att ta del av vad våra kolleger runt om på Novias fem campus gör. Att ta del av varandras arbete är det första steget till samarbete och samarbete har kanske aldrig varit viktigare än just nu!

St Olav Waterway

Anna Karin Abrahamsson

The main aim with the project St Olav Waterway (September 2016- March 2020) is to guarantee that the 625 km long route from Turku in Finland to Söderhamn in Sweden is marked and mapped. St Olav Waterway is half of the total 1200 km long pilgrim route between Turku and Trondheim in Norway. The route will be incorporated into other St Olav routes in Sweden on the way to its final destination Trondheim/Nidaros in Norway. The new route is unique, it is the only pilgrim trail that also includes waterways.

St Olav Waterway is named after a Norwegian saint. Sankt Olav used to be one of the most important Nordic saints and a unifying force between countries. Nidaros was one of Northern Europe's most significant pilgrimage site for 500 years. In the Middle Ages pilgrims would commemorate Sankt Olav by travelling from Novgorod to Nidaros.

In December 2018, St Olav Waterway was awarded a certificate as an official Olav way in the Nordic countries by the Association for the Cultural Route of St. Olav Ways.

St Olav Waterway opened officially in May 2019. A lot of local celebrations took place during the two months long premier tour which was free for all to join. Depending on time and energy, you were welcome to walk as long as you wished - from some hours to several weeks. Memories and images from the summer 2019 premier tour. (Text in Swedish.) <https://stolavwaterway.com/den-forsta-vandringen/>

The routes can be travelled in many ways. In addition to walking, visitors can kayak, sail, ride and bike. It is important that there are different options available.



Route maintenance is important also after the end of the project. Therefore, a bilingual association operating in Finland and Åland called Olav routes in Finland (Olofsleder i Finland rf - Suomen Olavinreitit ry, chair person: Björn "Nalle" Öhman, honorary secretary: Andreas von Bergmann) has been founded. The association is part of the Nordic umbrella association called Association of St Olav's Ways founded in 2018. Students from Novia University of Applied Sciences work with different assignments in close cooperation with the St Olav Waterway-project. The students are being supervised by appointed teachers and the work is carried out with the local entrepreneurs as clients. During 2019 students have been working with e.g. accessibility questions on the trail and the official opening seminar.

Målsättningen med projektet St Olav Waterway är att skapa en ny rutt, en S:t Olavsled, från Åbo i Finland genom skärgården och Kökar, Sottunga och fasta Åland till Grisslehamn i Sverige och därifrån norrut för att bindas samman med tidigare framtagna S:t Olavsleder i Sverige och Norge. Denna nya led skulle bli den första pilgrimsleden som också kommer att dras över stora områden hav och skärgård, den blir därför unik i världen. Ett av projektets huvudmål är att öka besökarnas antal under lågsäsong dvs. från april-juni och augusti-oktober.



Välmående av vilt - Hyvinvointia riiststa

Marianne Fred, Gunnel Englund, Mikael Wikström, Klaus Ekman, Petteri Pietarinen, Mikko Toivola (Finlands Viltcentral) Helena Liewendahl, Minna Pura (Hanken Svenska Handelshögskolan) Leena Erälinna, Johanna Mattila (Åbo Universitet, Brahea center)

Projektet handhas av YH Novia och som samarbetsparter är Finlands Viltcentral, Åbo Universitet Brahea centret samt Hanken Svenska Handelshögskolan. Projektet fokuserar på den växande vitsvanshjortstammen i syd-västra Finland och Nyland och strävar till att ge de jaktföreningar/ jaktlag som fungerar som piloter, verktyg att bemästra stammen på en hållbar nivå. Företagandet gällande jakten och förädlingen av köttet kan i framtiden ge landsbygden nya möjligheter.

Undersökningar gällande kundbeteende har gjorts gällande användning av viltkött vilken gav en fingervisning om vilka kundgrupper kan komma ifråga som konsumenter då mängden viltkött ökar på marknaden. Också gällande HoReCa-branschen har utredning gjorts om utmaningar och flaskhalsar i inköpsprocessen för viltkött. Dessa har stått som grund för den verksamhet som ingår i projektet och matchmaking mellan jägare och HoReCa sektorn har genomförts på olika plan.

Under våren utförde Viltcentralen en förfrågan till ca 5000 jägare inom projektområdet där man utredde vilka jaktföreningar och jaktlag hade stor tillgång på vitsvanshjortar och var i behov av att utveckla sin verksamhet genom köttförsäljning eller att få flere jägare med i sällskapet för att klara av de uppställda målen de olika myndigheterna ställer på jägarna ifråga om reduktion av stammens. På basen av förfrågan valdes drygt 20 pilotföreningar

och jaktlag ut som piloter i projektet och i november träffades jägarna samt representanter för styrgrupp och samarbetsparter i Loimaa. Ca 70 personer deltog i kick off-tillfället.

In the projekt we develop new operating models for hunting white tailed deer and increasing the availability of uninspected game meat on the market. The financing comes from the EU agricultural fund for rural development and the Finnish state. Partners are Novia University of Applied Science, The Finnish Wildlife Agency, Brahea Center at Turku University and Hanken School of Economics CERS. Projekt runs from 1.1.2019-31.7.2021



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Smart Marina - Contemporary harbours with soft energy technology

Rasmus Karlsson

The Smart Marina project is aiming to improve services in 34 guest harbours spread across the Central Baltic Sea. We will implement sustainable solutions in the harbors to comply with the standards of environmental certificates for guest harbours. Safety will be improved by educating harbour staff and investing in safety equipment. Seminars on different aspects of marketing will be held and an application for harbour services developed.

2019 was an important year for carrying out investments in harbour infrastructure. The harbours involved in the project receive financial aid to improve their services offered to visitors. In the eight Finnish harbours co-ordinated by Novia UAS, many investments were in place for the season of 2019 while some investments were finalised during the autumn. The most notable investments were the new service building and waste recycling bins on Brännskär, the replacement of the old jetties in Kirjais and Korpoström, utilizing an old stone pier for mooring on Högsåra and a new sauna and composting toilets on Stenskär.



The new jetty at Stenskär

34 gästhamnar i centrala Östersjön har fått finansiering för att utveckla servicen genom att investera i ny infrastruktur i hamnen. Novia fungerar som koordinator för de finska hamnarna i projektet. Flera stora investeringar genomfördes inför båtsäsongen 2019 och den största delen av de resterande investeringarna ska vara på plats innan säsongen 2020 drar igång.

The year also involved activities focusing on the service and safety aspects of the project. Safety courses for harbour personnel were arranged at Åland Maritime Safety Center. In April project personnel along with harbour representatives travelled to Denmark to visit five Blue Flag-certified harbours of different sizes. The aim was to get inspired by solutions for running different types of marinas in a functioning and eco-friendly manner.

In May a project meeting was held on Hiiumaa in Estonia. In connection to the meeting we visited three harbours in the project to see the plans and progress of investments. Similar events were arranged in September in the Archipelago Sea, when we visited four harbours co-ordinated by Novia, and in December when we paid visits to three harbours coordinated by Valdemarsvik municipality in Sweden.

An issue for the Finnish part of the project has been the absence of an organisation that certifies Blue Flag harbours, one of the main aims of the project. An important step forward was taken in late autumn when the Foundation for Environmental Education in Finland decided to re-introduce Blue Flag in Finland and a Smart Marina harbour was promised a spot as a pilot harbour for the certificate.

With only 10 months left of the project, and a lot of infrastructure investments still to come, as well as project dissemination on the Helsinki and Stockholm boat fairs, 2020 is set to be busy year.

Matregion Nyland – Ruokamaakunta Uusimaa

Samuel Pettersson

Projektet Matregion Nyland – Ruokamaakunta Uusimaa har under året jobbat utifrån fyra fokusområden eller s.k. tallrikar: den offentliga tallriken, turisttallriken, exporttallriken och Nylänningens tallrik. Under 2019 har fokuset legat på de två förstnämnda.

Den offentliga tallriken

Projektledaren deltog 31.1. i ett seminarium i Södertälje arrangerat av projektet Matlust under rubriken "Food planning – var finns maten i samhällsplaneringen".

MatLust är ett femårigt projekt vars mål är att bidra till en hållbar livsmedelsnäring i hela Stockholmsregionen. Huvudtalare var Kevin Morgan, en av Europas ledande auktoriter inom offentlig gastronomi och samhällsplanering.

För att tydliggöra fokus på ett av baslivsmedlen i vår kost, potatisen, började planeringen av Nypotatisfestivalen i Bromarv. Grundtanken var att genom sensoriska test lyfta intresset för och kunskapen om primörpotatis för att därigenom ge beslutsfattare tillgång till vetenskapligt material som underlag för beslut samt ge odlare argument för potatisens förträfflighet. Festivalen hölls 15 juni på Bromarv Torg. Samtidigt som sensorikpanelen arbetade hölls publika smaktester på torget där besökarna (ca 200 personer) fick rösta fram sin favorit bland tre potatissorter; Timo, Jussi och Annabelle. Annabelle vann omröstningen klart (70%)! Sensorikpanelens arbete fokuserade på terroirbegreppet för att se om det går att applicera på nypotatis. Terroirbegreppet kommer från vinvärldens sätt att knyta jordmån, framförallt mineraler, till smaken i vinet. Något liknande har aldrig tidigare gjorts varken på nypotatis eller vinter dito i Finland och det var därför med stor spänning som vi väntade på slutanalysen av sensoriktestet. Sensorikpanelens arbete leddes av ingenjörstudenten Riina Wallenius från Metropolia yrkeshögskola under ledning av Pii-Tuulia Laine. Panelen testade potatissorten Jussi från fem olika



Speaking at the Earth Market i Stockholm in May

odlingsplatser från Bromarv till Ingå. Slutresultatet blev en svag men tydlig skillnad i potatisen från Pojo. Efter jordanalyserna kunde vi konstatera att Pojojorden innehöll mellan 4 och 9 gånger mer kalk än de övriga växtplatsernas jordar. För att stärka kompetensen hos både producenter och kosthåll inom offentlig sektor, ägnat att öka andelen närproducerat i offentlig sektor, anordnades tillsammans med Laurea amk och Kuntahankinnat en dag om offentlig upphandling på Knehtilä gård i Hyvinge 23 maj. Ett 20-tal deltagare slöt upp. 13 november deltog ett antal av Novias projektpersonal samt en representant från SLC i ett möte med Raseborgs stadsdirektör, upphandlingsansvariga samt kosthållschef och grönsaksodlare i Raseborg för att utveckla möjligheterna att staden kunde köpa in, i första hand potatis, från lokala odlare. Vi identifierade ett antal flaskhalsar och problem, vilka överensstämmer i hög grad med analysen från Matlust konferensen i januari. Samtalen fortsätter i mars.

Turisttallriken

Efter seminariedagen om Kungsvägen och

maten längs den föddes idén om ett pilotprojekt om drycker och turism. Efter fler träffar inom Welcomeprojektet blev det klart att Fiskars och dryckesklustret där har en unik platsrelaterad möjlighet att utvecklas till ett mönsterexempel för dryckesturism.

Exporttallriken

Under hösten har Heidi Barman-Geust (projektassistent) kartlagt vilka livsmedels och råvaruföretag i Nyland som på sätt eller annat är engagerade i utrikesexport.

Nylänningens tallrik

Angående t i l lgången på nyländska livsmedel i andra försäljningskanaler än dagligvaruhandeln innehar Reko en särställning men Food Hubs av olika slag samt appen Pro Localis är nya inslag i bilden.

Övrigt

Under våren planerades och genomfördes också NOVIAs deltagande i Festivalen Earth Market (om markanvändning i stadsplanering) samt evenemanget "Artistic Undressing" av det nyplanerade bostadsområdet Norra Djurgårdsstranden, 17-19 maj.

Tillsammans med Harry Lindell, projektledare på Novia inom projektet cirkulär ekonomi, har vi utformat en studiehelhet kring rågbrödets livscykel i ett cirkulärt perspektiv. Två korta undervisningsfilmer har vi också producerat filmmanus till samt medverkat vid filmningen

Under hela vårterminen hölls ett antal Skype-möten med Mathantverkarna i Finland r.f., Jyväskylä ammattikorkeakoulu och Novia för att finslipa och anpassa regelverket för FM-tävlingen i Mathantverk som hölls i Jyväskylä 13-15 september. Översättning och expertformuleringar i bageriklassen hörde också till uppgifterna.



The Early potato festival in Bromarv, 15 June.

Projektet Matregion Nylan - Ruokamaakunta Uusimaa är ett treårigt projekt ägnat att utveckla en strategi för ett långsiktigt hållbart livsmedelssystem som lyfter och tar tillvara kunskaper och kvalitet bland nyländska livsmedels- och matproducenter. Offentlig gastronomi är en viktig del i projektet liksom att uppmuntra till breda och innovativa samarbeten mellan olika aktörer i livsmedelskedjan.



Europeiska jordbruksfonden för landsbygdsutveckling: Europa investerar i landsbygdsområden

Digitalisaatiolla luonnonvarat biotalouteen - DLB

Romi Rancken

From natural resources to bioeconomy through digitalization

The Ministry of Education and Culture gave universities of applied sciences a number of grants for so-called key projects in the year 2017. One grant of 1,7 million € was awarded a consortium of 11 universities for a three year long project with the goal to strengthen digitalization in the Finnish bioeconomy education. Novia is one of the partners in the consortium, which consists of all the universities of applied science offering education within the bioeconomy sector. The project ends on June 30th, 2020. The most visible product of the project is the Bioeconomy Game. The computer-based game can be used as a pedagogical aid in many courses in the curricula for forestry, agronomy, landscape planning and other studies within the bioeconomy sector. The game gives the students a possibility to practice decision-making and to experience the economic and ecological consequences of their decisions in a safe environment. The content was produced collaboratively by dozens of teachers from the universities involved in the project.

The project has also produced a number of web-based courses covering themes like bioenergy, production of protein-rich plants and circular bioeconomy. Novia has organized three GIS courses, 5 credits each. The courses follow the recently published quality criteria for web-based courses and have received very positive feedback from the participants.

DLB-projektet är ett treårigt spetsprojekt finansierat av UKM. Huvudmålsättningen är att stöda den digitala utvecklingen av undervisningen i bioekonomi på YH-nivå. Det här har uppnåtts bl.a. genom att utveckla ett bioekonomispel som ska stöda undervisningen i olika ämnen och överbygga ämnes och yrkesgränserna. Vidare utvecklas ett tiotal webbkurser av lärarna i de 11 yrkeshögskolor som är med i projektet. Novia har ordnat tre av kurserna, temat för dem har varit GIS inom bioekonomin och undervisningsspråket har varit engelska.



The start window of the Bioeconomy game.

Bondenyttan

Paul Riesinger

Praktisk samverkan bidrar till ett hållbart jordbruk

Bondenyttan startades våren 2018 vid agrologutbildningen på Yrkeshögskolan Novia i Raseborg. Bondenyttan finansieras av Stiftelsen Finlandssvenska Jordfonden. Ansvarig för Bondenyttan är AFD Paul Riesinger, lektor i växtodling vid Novia.

Bondenyttan utgår från ett samarbete mellan i regionen verksamma lantbruksföretagare och agrologutbildningen vid Novia. Detta samarbete har följande syften:

1. Innehållsmässigt syftar samarbetet till att höja skördenivåerna. Skördebegränsande faktorer identifieras och olika åtgärdsalternativ undersöks på gårdsnivå i form av fältförsök samt på Västankvarn försöksgård i form av småruteförsök. Lärdomarna från undersökningarna och försöken görs tillgängligt genom fältstigar, studiebesök, seminarier, föredrag och publikationer.

2. I samarbetet mellan lantbrukare, agrologstuderande och lärare tillämpas nya utbildningskoncept: För lantbrukarnas del utgår det deltagardrivna arbetet från de medverkande lantbrukarnas behov och intressen, med avseende på studerande och lärare bidrar arbetet till en praxisinriktad och mångsidig, och därmed en inspirerande och aktiverande utbildningsmiljö.

3. Försöken planeras, utförs och utvärderas i samarbete mellan agrologutbildningen, en ring av lantbrukare, Västankvarn gård, Västankvarn försöksgård och lantbruksrådgivningen (NSL). Bondenyttan drar nytta av och understöder ett redan befintligt naturbrukskluster.

4. Vid sidan om kunskapsnyttan, den pedagogiska nyttan och samarbetsnyttan resulterar projektet Bondenyttan i positiva sociala effekter. Lantbrukare och agrologstuderande involveras såväl fackligt som socialt i ett samarbete och bekräftas således i sin yrkesroll.

Under odlings säsongen 2019 utfördes fyra projekt:

1. Förutsättningar för odling av lusern (Mårten Holmberg)
2. Odling av lusern i södra Finland: sort- och odlingstekniska försök (Västankvarn försöksgård)
3. Förekomsten av ärtrotröta i västra Nyland (inventering på 9 gårdar, 24 fält)
4. Mullbalanser (litteraturstudier)

Projekten 1 och 3 redovisas våren 2020 av agrologstuderande i form av examensarbeten.



Fältstig hos Mårten Holmberg, Karis.

The project Bondenyttan (Farmers' Benefit) aims at bringing together agricultural education, farmers, extension services and research. The objectives of Bondenyttan comprise the adaptation of measures suited to sustain higher yield levels, and the application of participatory research (including farmers, students and teachers). The methods comprehend farm studies and field trials. Bondenyttan contributes to the development of agricultural practices, mobilises the resources at hand for agricultural education and endorses the social self-esteem of farmers.

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Novia Raseborg R&D Funding

The Novia Bioeconomy Research Team

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