

RESEARCH & DEVELOPMENT 2020



Novia UAS Campus Raseborg

NOVIA
UNIVERSITY OF APPLIED SCIENCES

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Research and Development in Bioeconomy 2020

Marianne Fred

Many things changed for good in 2020, and I think when reading this publication, it is clear we did our best to be part of the change, and we succeeded pretty well! We have managed to proceed with the projects, although many of our researchers and project leaders have had to change their plans and how they work. Staying safe and minimizing risks was everyone's priority, not least because a whole season's fieldwork and the safety of many collaborators and their near and dear ones, was at stake. Gatherings and social events are an important counterweight to the often long and solitary hours in the field. Even so in 2020, when the great outdoors offered possibilities for catching up after long days in the field.

In many projects where workshops and seminars were the main methods for gathering and spreading information, networking and exploring the field, the project leaders had to adjust to the new world quickly. In Bioeconomy RDI, we made the decision to work fully on-line quite early on. We also made the strategic decision not to postpone events until autumn, in the hope the situation would be better then. In hindsight, this meant we have been working quite effectively all of 2020, although we had to rethink many things. In spring 2020 when

NOVIA R & D IN BIOECONOMY

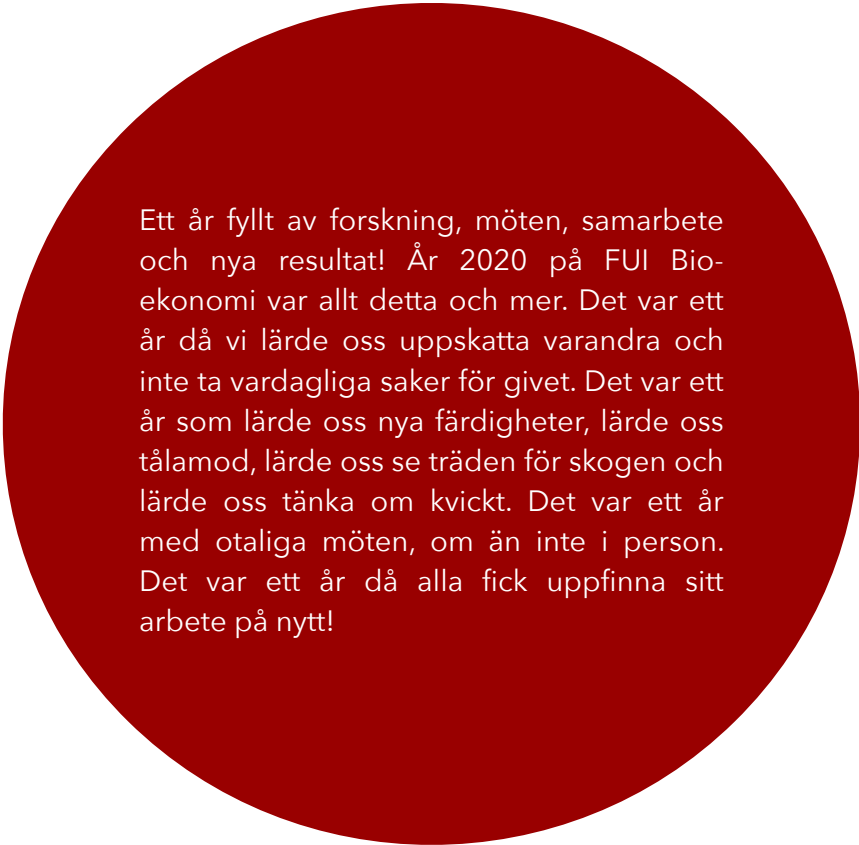
A year full of research, meetings, working together and finding new results! The year 2020 at Bioeconomy RDI was all this and more. It was a year where we learned to appreciate each other and not take everyday things for granted. It was a year full of learning new skills, learning patience, learning to see the forest for the trees, and thinking on our feet. It was a year of many, many meetings, although not in person. It was a year when everyone had to reinvent their work.



At the home office wearing the corona-uniform 2020

so many things were cancelled, our project leaders worked hard on finding solutions to keep on working together with our stakeholders. It turned out our collaborators and stakeholders were able to readjust and come out of their comfort zones, in order to work together in the new digital settings of Teams- and Zoom-meetings. Workshops have successfully been implemented, discussions have proceeded in breakout rooms, post-its have been placed on jamboards, and Lego-serious play has gathered people who have not played with Lego in 30 years in front of webcams to

and how they envision development in their field. Overall, I think we can be very satisfied with our efforts and how our projects turned out! This is important in a year when many of us have struggled with difficulties and tough situations privately and professionally. I for one am this year especially grateful when I read about all the work our researchers and project leaders have achieved, despite all. Keeping calm and carrying on has prevailed. In 2020 Novia UAS had a total RDI project portfolio worth 18 239 000 euro, Bio-economy RDI's share of the portfolio was 8 292 000 euro. In this publication, you can read about the work this financing has made possible.



Ett år fyllt av forskning, möten, samarbete och nya resultat! År 2020 på FUI Bio-ekonomi var allt detta och mer. Det var ett år då vi lärde oss uppskatta varandra och inte ta vardagliga saker för givet. Det var ett år som lärde oss nya färdigheter, lärde oss tålmod, lärde oss se träden för skogen och lärde oss tänka om kvickt. Det var ett år med otaliga möten, om än inte i person. Det var ett år då alla fick uppfinna sitt arbete på nytt!

Ecology of forest raptors and archipelago birds

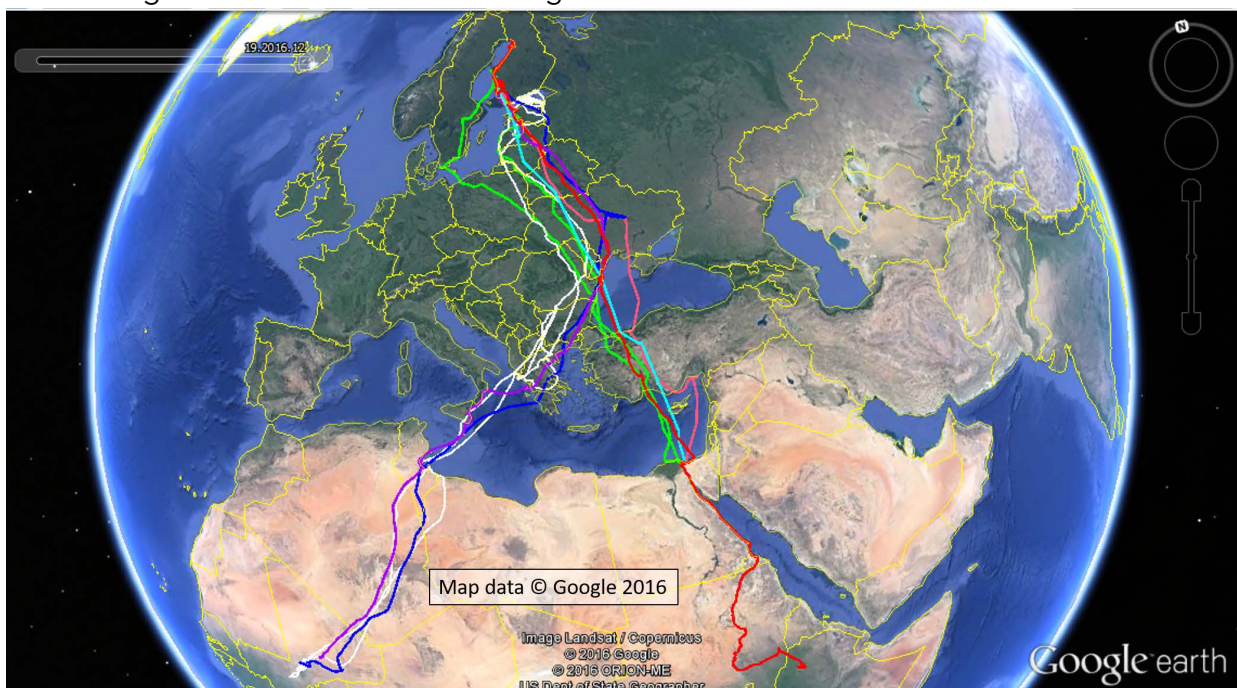
Patrik Byholm, Martin Beal, Julia Gómez-Catasús, Caroline Howes, Wouter Vansteelant

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

In 2020 we published a set of papers on the ecology of forest raptors. Two papers were on ecology of the European honey buzzard on its African wintering grounds, one on honey buzzard migration and in one paper we presented conservation related information on northern goshawks. Regarding the papers on honey buzzard ecology in Africa, a topic which until now almost nothing has been known about, we in the first paper showed that forest availability and fragmentation drive the movement behaviour of wintering honey buzzards. Where forest is fragmented birds move over larger

areas than where forest is abundant. In a second paper we showed that among the honey buzzards wintering in southern Africa over 90% are females. This supports the arrival-time hypothesis, which states that the sex responsible for establishing the breeding territory (the male in honey buzzard) will spend the non-breeding period closest to the breeding grounds, allowing them to reduce intrasexual competition for breeding territories. The third honey buzzard paper presented new findings on the migration strategies of soaring birds, and using 40 years of temperature data as a proxy for available energy over the sea, we show as a



Autumn migration routes of seven Caspian terns in 2017.

novel finding that the dynamics of the energy landscape can explain intra-specific variation in migratory behaviour not only over land but also over sea. In the fourth raptor paper we show that nest losses due to timber harvest of Northern goshawk nest stands has accelerated as compared between 1999-2005 and 2005-2013. This adverse impact of increased timber harvest on nest-occupancy patterns on the declining Finnish goshawk population does not only have negative impact on the goshawks themselves, but also on local biodiversity in general since goshawk nest stands host more biodiversity than forest fragments of similar size and type uninhabited by goshawk.

Regarding the research on archipelago birds, we in a joint paper with some national collaborators show that 100 years of ring recoveries deliver unreliable information on the location of the wintering locations of Finnish Caspian terns. This is due to a reporting probability bias in the ring recoveries of

Fyra olika vetenskapliga artiklar behandlande ekologin och naturskyddsbiologin hos skogsrovfåglar publicerades 2020. I två av dessa visar vi hur huggandet av skog inverkar på rovfåglar dels i Finland på deras häckningsområde, dels i Afrika på övervintringsområdet. En tredje artikel rapporterar om stark överrepresentation av honor bland bivråkar övervintrande i södra Afrika, medan ett fjärde visar att fåglar som typiskt flyttar m.h.a. termiker i motsats till vad man tidigare trott även kan utnyttja stigande vindar för att nå höjd när de migrerar över hav. Vi visar också att övervintringsområdet för finska skräntärnor i motsats till vad man tidigare trott av allt att döma inte är beläget i Nigerflodens inlandsdelta i Mali utan i Nildeltat i Egypten.



Timber harvest is the major reason for why Finnish northern goshawks lose their nests. Photo: Patrik Byholm.

wintering Caspian terns (geographic variation in reporting probability, ring-read and birds killed being overrepresented). The information got from GPS-logged birds (unbiased data source) differs significantly from that got from ring recoveries. Nile delta, not Niger Inland Delta, seems to be main wintering area of Finnish Caspian terns.

Collaborators

- Susanne Åkesson (Lund University, Sweden)
- 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)
- Markus Piha (Museum of Natural History)
- Craig T. Symes (University of the Witwatersrand, South Africa)

Affiliations

- Martin Beal (Lund University, Sweden & ISPA - Instituto Universitário, Portugal)
- Julia Gómez-Catasús (University of Madrid, Spain)
- Caroline Howes (University of the Witwatersrand; South Africa)
- Wouter Vansteelant (University of Amsterdam, Netherlands)



Climate change: plankton ecology and eco-physiology

Jonna Engström-Öst, Louise Forsblom,
Ella von Weissenberg, Minna Kohonen,
Amanda Silvennoinen, Anna Jansson

We published a comparative study in *Science of the Total Environment* comparing eco-physiological responses of two copepod species to extreme levels of ocean acidification that can occur in the future during coastal upwelling. The field experiment was conducted in mesocosms performed in a Raunefjorden off Bergen on the Norwegian westcoast. The mesocosm enclosures were treated with carbon dioxide, lowering the pH of the seawater, and simulating future acidification. The paper is a collaboration between Novia, University of Turku and GEOMAR Helmholtz Centre for Ocean Research Kiel. From GEOMAR, we worked with Ulf Riebesell and Carsten Spisla.



Optimal sampling conditions. Amanda Silvennoinen handles the CTD.

RESEARCH GROUPS

The main interest of our research group is to increase the understanding of ecological and eco-physiological responses to climate change in the marine pelagic environment. We use long-term data and work in field and lab with comparative approaches.

Main results showed that species migrating deeper during daily vertical migration were more robust to oceanographical changes in the water column.



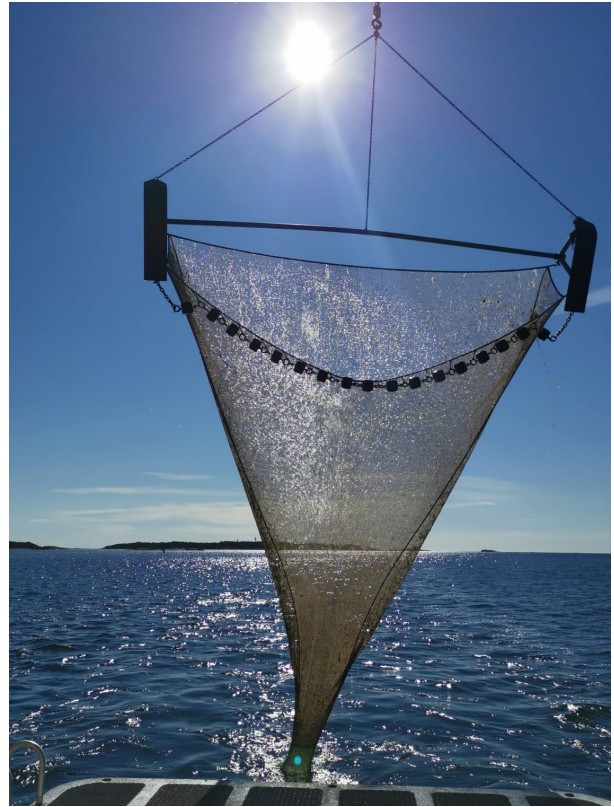
Without M/S Augusta the Baltic clam catch would have been quite tiny. Amanda joining the trip to Storfjärden.

Louise Forsblom defended her PhD thesis titled *Drivers of plankton populations in the Baltic Sea* 20 May 2020 online in Åbo Akademi University. The kustos professor was Kai Lindström and the Jacob Carstensen from the Technical University of Denmark served as the opponent.

Amanda Silvennoinen conducted an aquarium experiment studying the effect of the muscle relaxant diclofenac and pain killer ibuprofen on the Baltic clam *Limecola balthica*. After the 10-day incubation we collected samples for pharmaceutical residues, lipid concentration, stress biomarkers, shell size and dry weight. Preliminary observations tell that some mussel shells were thin and easily broken. More analyses will be conducted soon.



Minna and Ella with their zooplankton catch.



Baltic clams were collected with a trawl.

Collaborators

- Bednaršek Nina (Southern California Water Research Project, USA)
- Candolin Ulrika and Lewandowska Aleksandra (University of Helsinki)
- Feely, Richard A. (National Atmospheric and Oceanic Administration, USA)
- Klais-Peets Riina (Estonian Research Information System, Estonia)
- Lehtinen Sirpa and Lehtiniemi Maiju (Finnish Environment Institute)
- Lindén Andreas and Långvik Otto (Novia)
- Riebesell Ulf (GEOMAR - Helmholtz Centre for Ocean Research Kiel, Germany)
- Almén Anna-Karin & Scheinin Matias (Tvärminne Zoological Station)
- Vuori Kristiina (University of Turku)
- Zervoudaki Soutana (Hellenic Centre for Marine Research, Greece)

Affiliations

- Kohonen Minna (University of Helsinki)

Hur påverkas plankton av en förändrad miljö? Kan djurplankton anpassa sig till klimatförändringen? Vi forskar i hur klimatförändringen samt övergödningen i den marina miljön påverkar plankton i Östersjön. Vi jobbar främst med djurplankton och undersöker deras eko-fysiologi, reproduktionsframgång, stressnivåer samt populationsdynamik. Projektet var år 2020 finansierat av Svenska kulturfonden, Onni Talaan säätiö och Waldemar von Frenckells stiftelse, samt FunMarBio vid Åbo Akademi, samt LUOVA graduate school vid Helsingfors universitet.

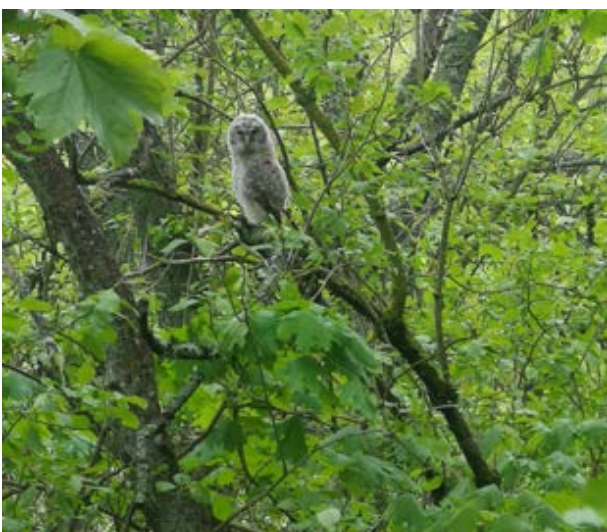
Functional ecology and applications

Patrik Karell, Chiara Morosinotto, Ruslan Gunko, Arianna Passarotto, Charlotte Perrault



Highlights of the year

In 2020 our research group was, despite the pandemic, able to implement research both in Finland and in Sweden, with the main focus on building a new infrastructure for research in collaboration with Lund University. The LES-project made great progress revealing interesting connections between people and the state of the environment they live in. Our research group also increased in size as both Arianna and Charlotte arrived in Novia through Erasmus internships and established new projects within the research group. In March Ruslan,



A tawny owl juvenile a few days after fledging. Our results show that bigger fledglings are more likely to recruit and that warm winters during the first year improves survival and affects how far they disperse.

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 and Kone foundation.



The Stadio Owlímpico research facility at Stensoffa ecological station, Lund University

Chiara and myself attended the OIKOS meeting in Reykjavik, Iceland, where we presented our research findings.

The Tawny owl project: In the beginning of the year Charlotte came to Novia to conduct the mobbing experiments in Vassböle, Ingå and wrote her MSc on these data. In spring Arianna came to participate in field work and to work on a long-term data set on movement ecology in the tawny owls. At the same time, focus was set also on building the 450 m² large aviary facility for owl research at Lund University, the 'Stadio Owlímpico'.

Later in spring we conducted field work both in Finland (led by Chiara, together with Jon Brommer), and in Sweden together with Swedish ornithologists Peter Ericsson and Lars-Ove Nilsson. The Swedish field work was aimed to provide owls for the studies we

then conducted at the Stadio Owlmpico. During summer Arianna and Charlotte worked in the project with the owls at our Stadio Owlmpico in Lund, where we collected detailed data on growth, behaviour and physiology. These data allow us to test predictions about mechanisms for coping with variable climatic conditions and stressful environments. The data on tawny owl reproductive biology collected in the field will allow us to connect the experimental work at Stadio Owlmpico with data from natural settings. In autumn after defending her MSc, Charlotte started to plan a PhD project, and after Arianna's PhD defence she constructed a research plan for a post doc project at Novia. Both these projects are aimed to include work at Stadio Owlmpico.

The LES project: Ruslan finalized his first manuscript dealing with the usefulness of

citizen science to assess water quality variation. The results show that the water quality assessment by the public corresponds well with assessment using scientific sampling methods. The work in LES greatly shows how we can engage people in society in data collection and simultaneously make people more aware of scientific research and the results we can achieve. The next step is to understand how the state of the coastal environment affects life satisfaction and the implications for society.

Collaborators

- Staffan Bensch and Jan-Åke Nilsson (Lund University, Sweden)
- Patrik Byholm and Jonna Engström-Öst (Novia)
- Jon E. Brommer and Timo Vuorisalo (University of Turku)
- Aleksi Lehikoinen, Hannu Pietiäinen, Jari Valkama, Daniel Burgas (University of Helsinki)
- Matias Scheinin (Department of Environmental Protection, Hanko)
- Markus Öst and Lauri Rapeli (Åbo Akademi University)
- Heikki Helanterä (University of Oulu)
- Carita Lindstedt (University of Jyväskylä)

Funktionell ekologi och dess tillämpningar

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 enkätundersökningar. I hur stor utsträckning kan man avverka skog utan att utarma biodiversiteten och ekosystem-tjänster 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?



In our research we study the role of camouflage in the life of the two (grey and brown) colour morphs of the tawny owl. In the picture a grey tawny owl. Picture by Charlotte Perrault.

Chemicals and pharmaceuticals occurrence and interactions in the environment

Otto Långvik and Jonna Engström-Öst

The insight of how phenomena and reactions in the environment are performed on a molecular level, are interesting and beneficial for the whole Novia bioeconomy research team. The results from ongoing projects will improve our know-how of specific biological systems in the coastal environment and how these react to new challenges of human interference such as chemicalization. Further, our research projects explore and explain how novel bio-based materials can be utilized for environmentally benign applications.

The first area we have focused on is to clarify to what extent chemicals, especially pharmaceuticals, are occurring in the surrounding environment. The objective is to conduct a detailed analysis of the local occurrences



In August 2020 the research group conducted an experiment in order to determine how Diclofenac, Ibuprofen and PFHxS interact with *Limecola Balthica* under controlled aquarium conditions.

RESEARCH GROUPS

The ongoing research projects: 1 *Novel Biomimetic Adsorption Materials Based on Lignocellulosic Composite Hydrogels* and; 2 *Organic pollutants in coastal waters, plankton communities and benthic fauna*; focuses to determine how selected chemical and pharmaceutical residues are localized and behave in the water environment. These ongoing research projects are based on the strong knowledge of synthetic, organic as well as materials chemistry.

and concentrations of selected pharmaceutical compounds, both in surface waters and plankton populations. Further, we have carried out experiments, under controlled conditions, to study the interaction, distribution and effect of pharmaceuticals and chemicals with the surrounding environment and organisms.

The second focus area is the utilization of lignocellulosic biomaterials and especially the wood derived hemicellulose fractions. The utilization of these specific and well characterized 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 interesting and promising biomaterial we study is the galactoglucomannan (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 crosslinked materials can be utilized. This second part of our work will focus on developing hydrogel-based materials which could be used as absorbents removing chemicals from the wastewater streams. Our novel hydrogel materials are created by utilizing 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

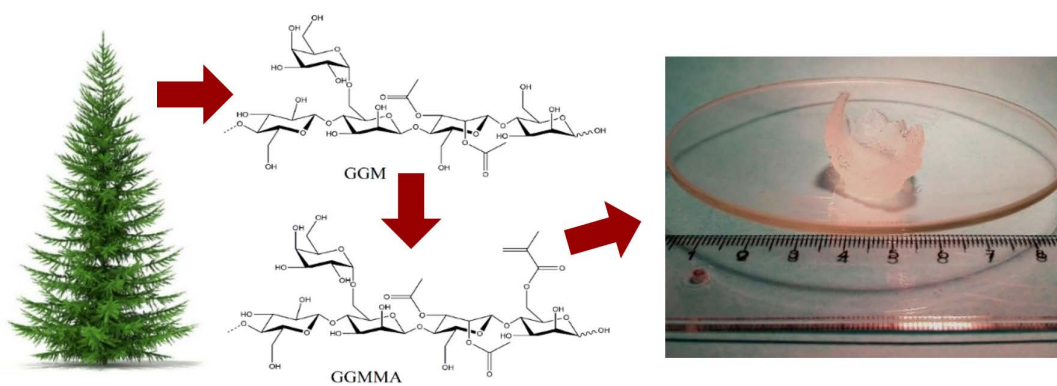
Ett av de aktuella forskningstema är att effektivt utnyttja olika vedbaserade, icke fossila, råmaterial för att på ett miljövänligt sätt framställa olika eftertraktade material. En av målsättningarna är att minska kemikaliseringsen av miljön och i ett inledande skede kommer vi att kartlägga förekomsten 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 bioraffinaderi-processer som befrämjar Bio- och Cirkulär-ekonomi.

temperature. Our results enable a simple, cost effective and scalable production of methacrylate functionalized GGM materials. The most promising materials, for removing pharmaceuticals and other organic micro-pollutants, will eventually be used first on a bench scale and evaluated for further utilization.

Furthermore, the group have been actively taking part in the education at Novia, organizing seminars and meeting, publication activities and applying for external project funding. We have have together with CH-Bioforce Oy managed to initiate a joint development projects, e.g. guiding one master's thesis with a focusing on the possible use of hemicellulose fraction in the production of specific and specialized multilayer composite products.

Collaborators

- Patrik Eklund and Chunlin Xu (Åbo Akdemi University)
- Matilda Kråkström (Turku Bioscience Centre)



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

Paper #1: *“Factors affecting consumer acceptance of cultured meat: A systematic review”*. The manuscript is prepared in December 2020 and recently submitted to a journal for peer evaluations.

The awareness of carbon emissions linked to livestock has triggered interest in more sustainable alternatives, among which cultured meat is a recent entry. A successful development of any novel food technology depends largely on consumer acceptance. This study analyses the peer-reviewed literature on consumer behavior towards cultured meat to synthesize the existing evidence and highlight priorities for future research. A systematic literature review was undertaken using the Web of Science, Science Direct and Scopus databases over the period 1980-2020, resulting in a final number of 43 articles meeting our selection criteria. The most important factors influencing consumer acceptance/rejection of cultured meat include public awareness, perceived naturalness, and food-related risk perception. Ethical and environmental anxieties urged consumers to be willing to pay a premium price for purchasing meat substitutes, but not necessarily the cultured meat. Also, food neophobia and uncertainties about food safety appear to be important factors impeding the uptake of

RESEARCH GROUPS

I am studying bio-based economy. My contribution to the Novia Bioeconomy Research Team (NBRT) involve business research and economics with application to food, agriculture, and natural resources. My primary interest is in the field of consumer behaviour in relation to acceptance of novel bio-based solutions. Consumer research is increasingly become important part of sustainable development. My main activities in 2020 included networking, writing two articles and a research proposal to be submitted in March 2021.



this technology. Availability of other substitutes such as plant-based meats, as well as product features, such as price and sensory appeal, are considered as important factors in reception of this technology. The effect of demographic factors is mixed. More research on the interrelationships between livestock production, food security and alternative meat products through a holistic and interdisciplinary approach is recommended.

Paper #2: *“Genetically modified food and consumer risk responsibility: The effect of regulatory design and risk type on cognitive information processing”*. This paper is submitted to the *PLOS ONE* journal and is currently under review.

The use of agro-biotechnology has increased consumer concerns about environmental, economic, ethical, and food safety risks. This study examines how policies

governing genetically modified (GM) food production impact consumers' cognitive information processing with reference to perceived risk, self-control, and risk responsibility. There is further analysis of whether the effect of policy design is moderated by risk type. Data were generated in a lab experiment (n=547), including four different policy scenario treatments (banned, research and development, import, and full commercialization). The results show that policy settings where GM food is available on the market are linked with higher levels of perceived risk and lower degrees of self-control compared with policies where GM food is prohibited. There was no evidence of policy affecting consumer willingness to assign personal risk responsibility. However, among participants who indicated health risks as their main concern, there was an effect from the policy scenario on self-risk responsibility as mediated through perceived risk and self-control. The results indicate that health-conscious consumers are likely to judge less responsibility to self in circumstances where a genetically modified product

Ashkan Pakseresht är en av de specialforskarna vid Novias forskningsteam inom bioekonomi. Fokus inom hans forskning ligger på möjligheter inom blå bioekonomi och särskilt på konsumentbeteende i förhållande till innovativa lösningar inom matproduktionen. Före han anslöt sig till Novias forskningsteam undersökte han konsumenternas inställning till genmodifierade livsmedel. Forskningen ledde till intressanta resultat om hur riktlinjer har ett avgörande inflytande på konsumenternas acceptering av innovativa lösningar inom matproduktionen. Fortsatt fokus inom forskningen av konsumenternas attityder till genmodifierade livsmedel planeras med beaktande av finländsk kompetens inom bioteknik.

was commercialized. These findings indicate a need to clarify guideline recommendations for health-related risks associated with foods derived from biotechnology.

Working Proposal #1: *"Examining factors affecting consumers' preference of cultured meat?"* the proposal is going to be completed in first period of 2021.

This project aims to examine the consumer acceptance and attitude towards cultured meat. The project aims to study factors influencing consumer acceptance/rejection of this technology.

In particular, we want to address the following research questions:

1. What are the consumers' cultured meat consumption preferences and priority compared to other meat alternatives?
2. What are the important factors influencing consumer acceptance/rejection of cultured meat?
3. Will factors prompt consumers willing to pay a premium price for purchasing meat alternatives?

Ongoing project: *"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. Recently, a data base of extant literature on application of blockchain on food supply chain has been collected and soon the analysis will be conducted.

Collaborators

- Maurizio Canavari (Bologna University, Italy)
- Carl Johan Lagerkvist and Anna Kristina Edenbrandt (Swedish University of Agricultural Sciences, Sweden)
- Sina Ahmadi (Sari Agricultural Sciences and Natural Resources University, Iran)

Ecophysiological adaptations to climate change

Chiara Morosinotto



Throughout 2020 I worked as postdoctoral researcher within the project led by Dr. Patrik Karell on evolutionary dynamics under environmental change. During this year my main tasks were to organize and analyze three datasets to investigate life history traits and telomere dynamics in the color polymorphic tawny owl (*Strix aluco*), which is characterized by a genetically determined coloration (either grey or reddish-brown).

I analyzed 40 years of data on tawny owl offspring mass at fledging and probability to recruit (i.e. to return to breed in the population in following years) according to parental color morph; data were collected in Uusimaa 1979-2017. I found that offspring of brown pairs are consistently heavier than offspring of other morphs, independently on food availability. Heavier offspring at fledging have higher probability to recruit to the local population, especially when the winter temperature in the period post-fledging are mild. These results were published in *The American Naturalist*.

During this year I also organized and analyzed a large dataset on tawny owls

I am Chiara Morosinotto, postdoctoral researcher working on the project led by Dr. Patrik Karell on evolutionary dynamics under environmental change in tawny owls (*Strix aluco*). During this year I analyzed three extensive datasets to investigate how tawny owl color morphs vary in their life history traits (mass at fledging and recruitment) and telomere dynamics (at different life stages and according to parental traits). I co-supervised a master thesis on passerines mobbing behavior according to predators' color morph. I organized the monitoring and collection of samples from the tawny owl breeding population in Uusimaa and helped in designing behavioural experiments to be conducted in captivity in aviaries at Lund University.

telomere dynamics (over 500 samples across 10 years of data) that I measured in the lab at Lund University (Sweden) during 2019. Telomeres are useful molecular biomarkers of aging and condition. From this large dataset, I tested if telomere length is morph-specific across three different life stages: young nestlings, fledglings and first breeders. I found that individuals do not vary in their telomere length according to color morph during nestling phase nor as young adults. A previous study of Dr. Karell however showed that adult tawny owls exhibit color morph-specific telomere dynamics, with adults of the brown morph having shorter telomeres and faster telomere shortening than grey adults. These results combined suggest that the two color morphs do not differ in telomere dynamics when young but exhibit morph-specific dynamics among experienced breeders, probably as a consequence of different life history strategies, like differential reproductive effort (parental care), adopted later in life.

RESEARCH GROUPS

These results were accepted and published in early view in December 2020 in *Journal of Avian Biology*. I also presented these results in an oral presentation during the Nordic Oikos conference held in Iceland in March 2020. From this dataset, I also tested if offspring inherit telomere length from their parents and if this pattern is affected by parental traits. I found strong inheritance of telomere length from both parents and that paternal age strongly affects offspring telomeres: offspring of older fathers have shorter telomeres. A manuscript is currently in preparation.

During spring 2020 I organized the monitoring of the long-term breeding population we have in Uusimaa and helped to collect biometric and physiological data on breeding individuals. During Autumn 2020 I also visited the aviary built at Lund University to take care of the owls and plan future behavioral experiments in captivity. Throughout the year I also helped in organizing the datasets and samples for the analyses of thyroid hormones, mitochondrial activity and oxidative stress in tawny owls, which are currently carried out by our collaborators from University of Turku (Finland): Dr. Suvi Ruuskanen, Dr. Antoine Stier and Dr. Bin-Yan Hsu.

During 2020 I co-supervised, together with Dr. Patrik Karell, the MSc thesis of Charlotte Perrault (MSc in Biodiversity, Ecology and Evolution; University of Paris-Saclay, France) investigating passerines mobbing behaviour toward tawny owls of different color morph. Charlotte will start in January 2021 a PhD within our group to further investigate how predator and prey dynamics vary in different climatic and environmental conditions. I also continued to supervise the PhD thesis of Giulia Masoero (PhD in Biology, University of



Chiara with an adult tawny owl just before release

Turku), together with Prof. Toni Laaksonen and Prof. Erkki Korpimäki. Giulia successfully defended her thesis on pygmy owl population dynamics and effects of climate change in November 2020 and two papers from her thesis were published this year (published in *Oecologia* and *Global Change Biology*). In November 2020 I also attended to a course in academic teaching at Lund University, aiming to improve my skills as teacher and supervisor, and I co-organized the course in Conservation Biology at Novia University together with Dr. Jonna Engström-Öst.

Finally, in addition to my main project on tawny owls, I continued my collaborations with several universities and research groups. I continue my collaboration with the University of Turku not only through the last paper included in Giulia's PhD thesis (manuscript submitted) but also via a collaboration with PhD student Daniele Baroni, investigating habitat characteristics

in breeding and food hoarding sites of pygmy owls (manuscript was just accepted and will be published in early 2021 in *Forest Ecology and Management*). I also continued my collaboration with the University of Padova (Italy), started 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 in a small viviparous fish, the guppy. Two papers resulted in 2020 from this collaboration (published in *Ecology and Evolution* and in *Behavioral Ecology*) and one manuscript is currently in preparation. Finally, my previous collaborations with

University of Oulu, Luke and University of Cape Town resulted this year in two publications on pied flycatcher social information use (published in *Oecologia*) and on tits nest characteristics across Europe (published in *Journal of Biogeography*). Another collaboration with these 3 research institutions resulted in a manuscript currently under revision on redstart nest cavity choice depending on multiple environmental stressors (manuscript submitted).

Collaborators

- Jon E. Brommer, Suvi Ruuskanen, Antoine Stier, Bin-Yan Hsu, Toni Laaksonen, Erkki Korpimäki, Giulia Masoero, Elina Koivisto and Daniele Baroni (University of Turku)
- Jukka Forsman and Jere Tolvanen (Luke)
- Olli Loukola (University of Oulu)
- Staffan Bensch and Jan-Åke Nilsson (Lund University, Sweden)
- Robert L. Thomson and Angela Moreras (University of Cape Town, South Africa)
- Andrea Pilastro, Silvia Cattelan, Alessandro Grapputo and Matteo Griggio (University of Padova, Italy)

Jag jobbar som post doktoral forskare i Patrik Karells akademiforskarprojekt om eko-evolutionär dynamik i respons till miljöförändringar med fokus på kattugglan och dess gråa och bruna genetiska varianter. Under 2020 färdigställde jag en omfattande studie i tidsskriften *American Naturalist* där vi undersökte skillnader i tillväxt mellan bruna och gråa kattugglor under uppväxten och hur klimatet den första vintern påverkar deras möjligheter att överleva. Jag har även sammanställt en forskningsrapport om cellernas åldrande under olika livsstadier hos kattugglan och hur detta återspeglas i individens evolutionära duglighet och jag arbetar med en annan forskningsrapport var fokus är hur cellernas åldrande nedärvs mellan generationer beroende på föräldrarnas egenskaper. Jag handledde ett Erasmus+ magistersarbete vid Université Paris-Saclay om skyddsfärgens betydelse för en rovfågel att undvika mobbning. Under våren gjorde jag fältarbete i västra Nyland där vi samlade in häckningsdata från vår kattugglepopulation och under hösten arbetade vi med att planera beteende experiment och fysiologiska mätningar vid Lunds universitet.

Dispersal in a polymorphic raptor

Arianna Passarotto

During my PhD I received an Erasmus+ grant, which allowed me to do a six-month traineeship at Novia University within the group led by Dr. Patrik Karell. During my stay, I explored the movement ecology of tawny owls using 40 years of data collected in the study area in Nyland. First, I focused on natal dispersal, comparing the behaviour of the two morphs. Dispersal has important implications in birds' life. The decisions where to settle and how far disperse before doing so depend on both individual and environmental factors. I analysed the dispersal distances of the two morphs in relation to different individual and environmental features, in particular winter temperature. I found that, in milder winters, both morphs dispersed at similar distances, while in colder winters grey individuals dispersed longer distances. This suggests that the morphs adjust their dispersal differently depending on the winter severity. A manuscript based on these results is currently in preparation.

During my stay at Novia, in spring 2020, I also took part in the monitoring of the long-term breeding population of tawny owls in Västra Nyland. In addition, I gave a seminar at the Novia Research Seminars, where I presented the main results of my PhD studies. During summer 2020, I worked as a research technician with captive tawny owls

Through 2020, I carried out the last part of my PhD studies and I defended my thesis in October 2020. The latter, titled "The role of ecology in the evolution of coloration in owls", tackled the ecological factors promoting the evolution of colour variability in owls under different perspectives using both comparative and field data.



Arianna with tawny owl owlets just before measuring and ringing

in the project's aviaries at Lund University in Sweden. I took care of the owls, gathered behavioural and biometrical data for future studies and planned future behavioural experiments. When in Sweden, I also took a course about Laboratory Animal Science at Lund University. In autumn, I stayed at home in Italy for almost two months to prepare my dissertation and, after the defence, in November, I went back to Lund to continue the research with the captive owls in Patrik's research group.

Mitt namn är Arianna Passarotto och jag är en ornitologiskt inriktad evolutionsekolog från EEZA (Experimental Station of Arid Zones), ett forskningsinstitut i södra Spanien där jag gjorde min doktorsavhandling och disputerade i oktober 2020. Under de sista månaderna av min doktorandutbildning gjorde jag ett sex månaders gäst-forskarutbyte på Novia i Patrik Karells forskningsgrupp, där jag sammanställde en forskningsrapport om skillnader i rörelsemönster hos kattugglans färgmorfer i förhållande till klimatet. Under mitt gäst-forskarbesök vid Novia deltog jag också i fältarbete för att samla in häckningsdata om kattugglor och under sommaren och hösten jobbade jag med voljärkattugglorna som projektet håller vid Lunds universitets ekologiska station.



Collaborators

- Jesús M. Avilés and Ángel Cruz-Miralles (EEZA, Estación Experimental de Zonas Áridas, CSIC, Spain)
- Emilio Rodríguez-Caballero (University of Almería, Spain)

Camouflage abilities study using mobbing behavior

Charlotte Perrault (University of Paris-Saclay), Patrik Karell, Chiara Morosinotto

The experiments were conducted in the village Vassböle in Ingå, western Uusimaa, in different sites, using owl mounts (2 for each color morph). Each site had one bird feeder and one pole to put the owl mount. In order to quantify how fast the owl was detected in the wild, I used mobbing behavior which is an antipredator response made by the passerines. When passerines are noticing a potential predator, they gather and start performing stereotyped behaviour such as alarming and harassing, in order to make the predator leave the area. My MSc thesis allowed to highlight that the two morphs are detected at the same time by the mobbing birds, but that the grey one seems to trigger a stronger response, i.e. faster alarm latency for the first bird that approaches the owl mount and longer lasting mobbing. Thus, the two different morphs show the same



Picture and scheme (seen from above) of the experimental design, the owl mount is highlighted in orange,

RESEARCH GROUPS

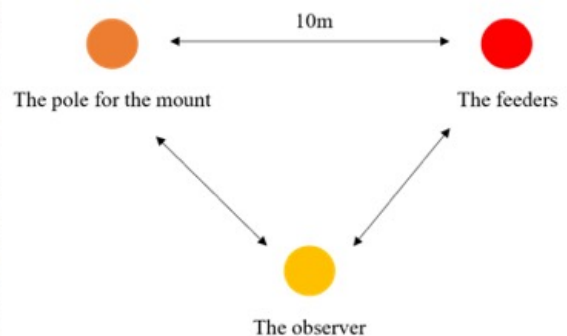
In February 2020, I came from the University of Paris-Saclay in France, to Novia as an Erasmus student for my MSc thesis. The aim of this thesis was to experimentally test the camouflage abilities of tawny owls (*Strix aluco*) in the wild using mounted owls and study the passerines' mobbing behavior if and when they detect the owl. Understanding the owl camouflage abilities in this changing environment is important because it will allow us to understand the evolution of this species population dynamics.



Two different tawny owl mount used during the mobbing experiments (brown on the left, grey on the right)

camouflage ability. However, the grey morph seems to be a bigger threat for the mobbing birds.

After my Master's thesis, I worked in Lund (Sweden), as a research assistant for Patrik Karell's project with captive tawny owls. In this project, we study the growth, develop-



ment, behavior and physiology of the tawny owl colour morphs.

I also had the chance to help during the respirometry tests in November, which consisted in measuring the owls oxygen consumption while being exposed to different temperature.

Starting a PhD from January 2021 at UTU/ Novia, I will continue the camouflage project both in Sweden and Finland.



Jag är Charlotte Perrault och jag kom i februari 2020 till Novia som Erasmus student för att göra min Masters. Målsättningen med mitt Masters projekt var att förstå skyddsfärgens betydelse för bruna och gråa kattugglor genom att utföra ett försök med uppstoppade ugglor i naturen. Jag undersökte om ugglornas färg påverkar hur snabbt småfåglar reagerar på ugglorna och hur de flockas för att mobba och försöka jaga bort dem. Min Masters utgör en del av det pågående kattuggleprojektet på Novia där vi undersöker evolutionära anpassningar till förändrade klimatförhållanden.

Ecological drivers of altered bird migration in a changing climate

Andreas Otterbeck

Highlights of the year

2020 became in many ways a very special and different year. The pandemic situation provided several new challenges, and my research activity was conducted through distance work. Nevertheless, as my project is not dependent on any fieldwork abroad, my PhD-project continued more or less as planned. During the year, I submitted two manuscripts to peer-reviewed journals, and additional 2 projects were close to completion. Besides these manuscripts and projects, I attended multiple online courses at University of Helsinki as part of my doctoral school, and also the BOU2020 (British Ornithological Union) online-conference with my presentation "Climate induced range shifts explain trends in bird migration passage dates". I also contributed to the Novia-column "Varför bygga nytt bo varje år?" published in Västra Nyland 26.5.

2020 blev på många sätt ett mycket speciellt och annorlunda år på grund av pandemin. Ändå fortsatte mitt doktorandprojekt vid LUOVA (Helsingfors universitet) mer eller mindre som planerat med inlämning av färdiga manuskript, kurser och presentationer. I min avhandling har jag särskilt fokus på nordiska fåglar och långa tidsseriedata för att förstå hur fåglar hanterar klimatförändringarna nu och i framtiden.

RESEARCH GROUPS

The aim with my PhD is to unravel unsolved puzzles regarding the ecological pressures and population dynamics of climate responses in migration. For this thesis, Nordic birds offer the most suitable model system, with a wealth of long-term datasets. I enrolled as a PhD student at the University of Helsinki in May 2019, in the LUOVA Doctoral Programme in Wildlife Biology Research with my main supervisor being Andreas Lindén (LUKE), and second supervisor Aleksi Lehikoinen (University of Helsinki).

Collaborators

- Patrik Byholm and Ruslan Gunko (Novia)
- Edward Klun and Markus Piha (University of Helsinki)
- Robin Cristofari (University of Turku)
- Karl Inne Ugland, Stein Fredriksen and Kjell Magnus Norderhaug (University of Oslo, Norway)
- Vidar Selås (Norwegian University of Life Sciences, Norway)
- Eeva Ylinen (University of Eastern Finland)
- Independent: Jan Tøttrup Nielsen (Denmark) and Eric Roualét (Norway)



Supervisor Andreas Lindén observing the bird migration over Hanko



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

Ella von Weissenberg (University of Helsinki), Anna Jansson, Jonna Engström-Öst

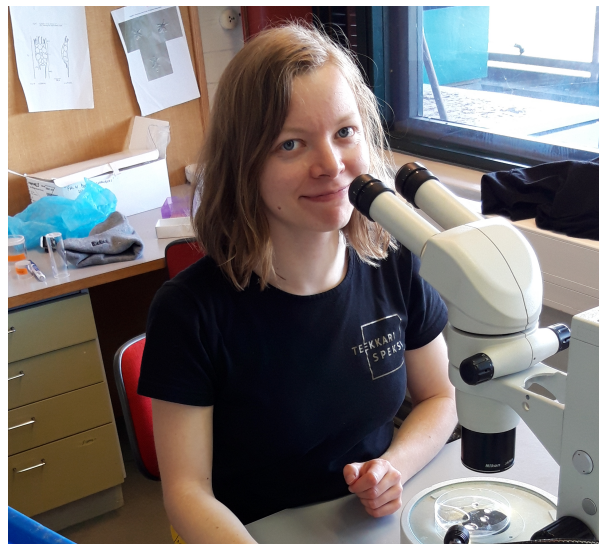
During the second year of my PhD at Novia I conducted a field campaign and a laboratory experiment at Tvärminne Zoological Station, a possible combined effect of salinity and temperature on copepod reproduction and oxidative status (von Weissenberg et al., in prep.).

We were happy to have Minna Kohonen in our team during summer. She studied the body size of the copepod *Eurytemora affinis* for her Bachelor's thesis accepted in the University of Helsinki in autumn 2020. Minna's main results showed that body size correlated negatively with temperature and salinity in the field.

I min doktorsavhandling undersöker jag hur sjunkande salthalt och uppvärmning påverkar djurplanktons reproduktion och eko-fysiologi. Jag samlar data i fält, fältexperiment samt via analyser i laboratorium. Jag använder också långtidsdata från Tvärminne zoologiska station.

RESEARCH GROUPS

I study the effects of climate change on oxidative status and reproductive output in marine zooplankton, and I am being funded by Onni Talas Foundation and Svenska kulturfonden.



In March, I held an oral presentation entitled in the OIKOS Nordic conference in Reykjavík.

Collaborators

- Anttila Katja, Uurasmaa Tytti, Mottola Giovanna and Vuori Kristiina (University of Turku)
- Mostajir Behzad and Vidussi Francesca (Université de Montpellier, France)
- Zervoudaki Sultana (Hellenic Centre for Marine Research, Greece)



Happy faces during sampling: Ella von Weissenberg and Minna Kohonen

The great cormorant project II

Patrik Byholm, Andreas Lindén (Luke)

Highlights of the year

The preliminary analysis of the material related to the original *The great cormorant project* resulted in an intern report in June 2020. As judged from GPS-tracking, the preliminary results here reveal, 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. Largely responding to regional requests from different stakeholders, the fieldwork with cormorants expanded to Österbotten in 2020 and in early June we equipped five new birds with GPS-trackers there. Also, in Nyland a handful of new birds were caught and equipped with GPS-trackers. The trackers are continuously collecting data describing the movements of cormorants and new

2020 expanderade storskarvsforskningen till Österbotten och även i Nyland försåg vi ett antal nya skarvar med GPS-loggers. Loggrarna samlar kontinuerligt in data som beskriver skarvens rörelser och nya publikationer som presenterar resultaten planeras sändas in för publicering inom en nära framtid.

RESEARCH PROJECT

As an expansion of *The great cormorant project* which ended in late March 2020, the work with great cormorants expanded to Österbotten in summer 2020.



A great cormorant being equipped with a GPS-logger by Patrik Byholm (to left) and Andreas Lindén. The bird itself is hidden in the hands of the researchers. Photo: Marina Nyqvist.

publications presenting the results are scheduled for publication in the near future.

Collaborator

- Pekka Rusanen (SYKE)



LES: Life quality in Raseborg

Ruslan Gunko, Patrik Karell, Lauri Rapeli,
Matias Scheinin, Timo Vuorisalo



In 2020 the first analysis of collected data was done. The first aim of our research group was to investigate the reliability of the data collected by citizens and its potential use for scientific purposes. The subjective data represented citizens' evaluation of water conditions and the socio-demographic background of the respondents (e.g. gender, age, education, etc. parameters) in Raseborg, Finland. In other words, we tested the accuracy of lay people's water quality evaluation by visual parameters. For this, we georeferenced respondents' answers on water quality in their local surrounding and compared their answers with water quality data collected in the ice-free season in the same localities in the Raseborg archipelago. The objective data was represented by parameters that can be potentially reflected in visual conditions of the water: the amount



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.

of chlorophyll-*a*, water turbidity, and dissolved organic matters. As a result, we found strong connections between people's evaluation and amount of dissolved organic matters: over 70% of the respondents assessed water quality in the right direction and almost 60% were correct in their estimates. Thus, we concluded that data collected by citizens is reliable and can be used for the water quality assessments on a local scale. Potentially, using local inhabitants for the assessment of the environment can be beneficial for the local councils and researchers as a result of the involvement of people in the process. Inhabitants can indicate hot-spots and give a preliminary understanding of the state of the environment. The results of this analysis are presented in the research paper, which is submitted to the scientific journal.



Two The same place can look totally different after few weeks: eutrophicated water in summer and in normal conditions during the spring. Photos: Hernán Abad Ortega and Jonna Engström-Öst

The second part of our project is aiming to understand the importance of the environment for people's life quality. For this, we are comparing how objectively determined vs subjectively assessed water quality affects overall assessment of life satisfaction. We also investigate the effects of other socio-economic factors (e.g. income, health). In our plans for 2021 is to finish a manuscript based on this analysis and submit it to a scientific journal.

Moreover, we are planning to study the effect of the pandemic on people's perception of the local environment and its potential impact on the environmental behavior of the society. Our aim here is to find out if pandemic changed the approach to the local environment from inhabitants and shifted their everyday life into an environmentally friendly way. For this, we will repeat the survey of inhabitants in Raseborg by adding pandemic-related questions.

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

Affiliations

- Lauri Rapeli (Åbo Akademi University)
- Matias Scheinin (Department of Environmental Protection, Hanko)
- Timo Vuorisalo (University of Turku)



Lantbruk 2.0 – sustainable agriculture in Uusimaa

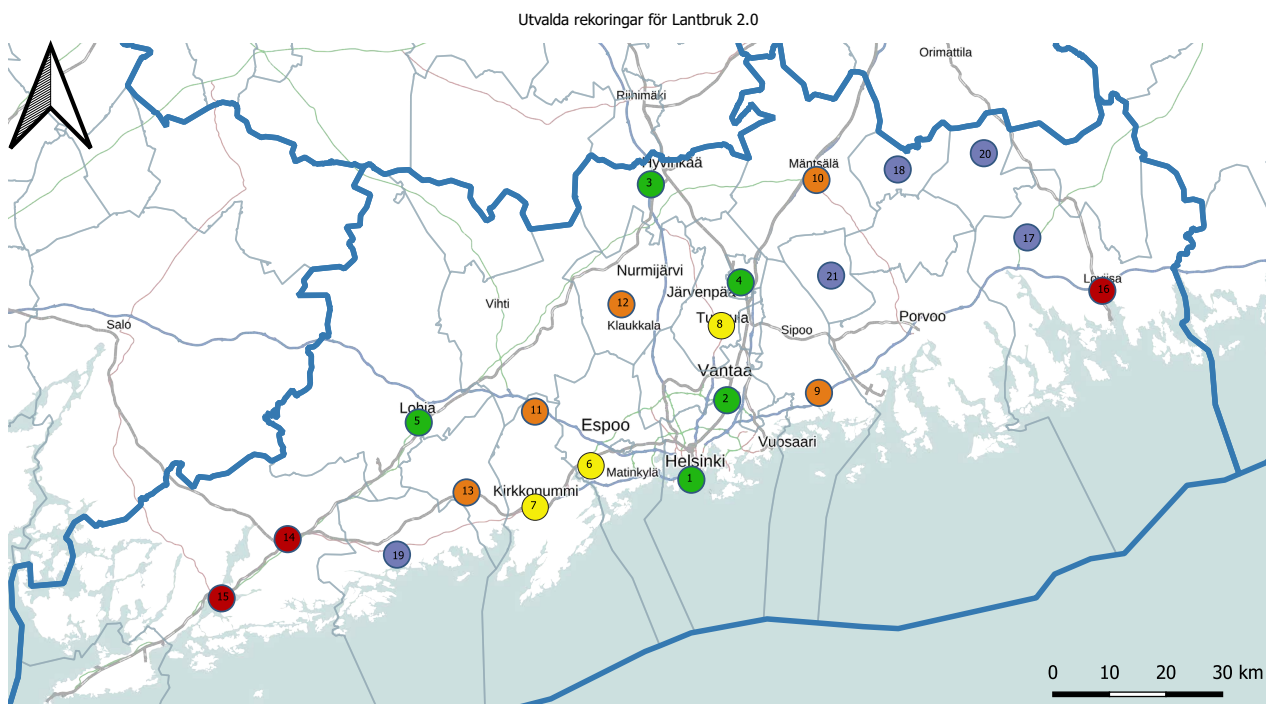
Ulrika Dahlberg

The project *Lantbruk 2.0* is working with farmers and organizations to promote sustainable agriculture, circular economy, and entrepreneurship in the Uusimaa-region.

Lantbruk 2.0, funded by The Swedish Cultural Foundation in Finland, started its activities in March 2020. The aim of the project is to collect and distribute information about sustainable agriculture, such as re-generative farming and pasture-raised cattle, and to support a shift towards a circular economy in agriculture. Entrepreneurship and the distribution of sustainably produced food through local food chains is also very much in the center of the projects' interests.

During the first year, the project focused mainly on collecting information from REKO-

rings, where producers sell local food directly to consumers. Since the commerce takes place in Facebook-groups before products are handed over to consumers, much of the information is lost when old posts are deleted. Therefore, the project selected 21 REKO-rings in Uusimaa to follow in real time. The prices of tomatoes, early potatoes, eggs, minced beef, and bread were documented and analyzed. The distance between the producers and REKO-distribution points was also checked. The results point towards a very small or no difference between the prices of organic and



- Inre stadsområde
- Yttre stadsområde
- Kransområde kring staden
- Lokala centra på landsbygden
- Stadsnära landsbygd

- | | | |
|--------------------------------------|---------------------------|-----------------------------|
| 1 REKO Helsinki, kantakaupunki | 9 Reko Söderkulla | 17 Reko Lijjendal – Loviisa |
| 2 Reko Tikkurila | 11 REKO Veikkola | 18 REKO Pukkila |
| 3 Hyvinkään farmarin markkinat/REKO | 10 REKO Mäntsälä | 19 REKO Ingå – Inkoo |
| 4 Järvenpään farmarin markkinat/REKO | 12 Nurmijärven REKO | 20 REKO Myrskylä |
| 5 REKO Lohja/Lojo | 13 REKO Sjundeå / Siuntio | 21 Reko Pornainen |
| 6 REKO Espoo Kauklahti Esbo Köklax | 15 REKO Ekenäs/Tammisaari | |
| 7 REKO Kirkkonummi | 14 REKO Karis/Karjaa | |
| 8 Tuusulan lähiruokarengas REKO | 16 Reko Loviisa | |


conventionally produced products in REKO, compared to prices in grocery stores. Overall, prices in REKO are higher than in grocery stores, due to small scale production. The distance the producer travels to the REKO-distribution is longer in cities than on the countryside.

To dive deeper into the theme of local food, a workshop about different ways of selling food directly to consumers was organized and. A group of agrology students interviewed meat producers about their choice of channels for selling their products, profitability, sustainability aspects and made a report for the project. Also, cooperation with the project KUMAKKA at the Ruralia Institute at University of Helsinki was initiated. KUMAKKA focuses on Community Supported Agriculture (CSA), a model that connects the consumer and producer more closely, by allowing the consumer to

subscribe to an amount of the harvest of a farm.

The project had two trainees during the year. Martina Schmidt, who studied environmental planning at Novia, collected and analyzed material from REKO-rings and wrote her thesis based on it. Olga Angove, who studies Sustainable Coastal Management at Novia, did farm-visits and produced text and visual material for the project.

Project-led open UAS-courses were re-scheduled from 2020 to start in autumn 2021 instead, but the planning of two courses about growing vegetables according to the Market gardening-model, with efficient use of small areas for cultivation, started.



Projektet fokuserar på hållbart lantbruk, cirkulär ekonomi och entreprenörskap i Nyland. Som försäljningskanal för hållbart producerade lantbruksvaror lyfts lokala, korta leveranskedjor fram. Under det första året har vi samlat in information från Nyländska REKO-närmatsringar, för att kartlägga produktutbud och priser. Projektets nätverk består av studerande, lantbruksföretagare och branschorganisationer samt andra projekt.

Välmående av vilt - Hyvinvointia riiststa

Gunnel Englund

Workshops har under 2020 arrangerats för HoReCa-branschen samt jägare gällande tillvaratagandet av hela djuret (nose to tail) och köttet har förädlats till olika konsumentvänliga produkter ss korv och paté. Regler och bestämmelser har diskuterats mellan jägare och myndigheter gällande kött-hantering, bla hygien, spårbarhet samt nivån på hur slaktskjulen är konstruerade. Kommunikationen gällande jakt, viltvård och viltkött har från olika perspektiv behandlats. Kommunikationen och dialogen har konstaterats vara grunden för att attityd-förändringar kan ske både bland jägare och

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.

allmänheten och idag råder delvis kunskapsbrist om vad jakt och viltvård innebär. Både studerande, konsumenter och jägare har involverats i denna process.

En digital handbok gällande försäljning av viltkött har gjorts på både finska och svenska för att underlätta jaktföreningarnas och jaktlagens möjligheter att eventuellt inleda försäljningen av kött från vitsvanshjort då mängderna nedlagt vilt ökar. Via handboken klargörs begrepp gällande okontrollerat kött och försäljning av detta till konsumenten. Samtidigt har också möjligheten till namnskydd för den frilevande vitsvanshjorten i



Finland utretts samt problematiken kring spårbarheten.

Under våren 2019 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 kött-försäljning eller att få flere jägare med i sällskapet för att klara av de uppställda målen gällande reduktionen av stammen. En rapport har utarbetats enligt uppgifterna från denna enkät.

In the project 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 1.1.2019-31.7.2022.

Communication has been a red wire throughout the project's operations in 2020. The project has arranged webinars about hygiene in meat management, the requirements of meat sales and the arrangement of guest hunting. The project has also arranged practical meat cutting courses at the pilot associations and the possibility of game meat processing has been addressed.



Webinar har ordnats gällande bla hygienkrav vid köttantering, försäljning av förädlade köttprodukter, jakthistoria från Europa samt ordnande av gästjakt.

Arbetsgruppen har sammankommit till drygt femton möten och styrgruppen har under 2020 haft tre möten.

Project partners

- 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)



Europeiska jordbrukstonden för landsbygdsutveckling: Europa investerar i landsbygdsområden



Matregion Nyland - mapping the food identity of Nyland (Uusimaa)

Christos Granqvist, Eduardo
Grisales Jaramillo



Matregion Nyland got a new project leader on Februari 1st 2020, Christos Granqvist, bringing in a broad network from the business world. He also created new contacts with, among others, the food related projects at the Laurea high school. A cooperation with the Perho college was initialised in order to create a cooperation regarding the HoReCa-business in Uusimaa.

Terroir maps

To find optimal agriculturing areas for new potatoes and apples, terroir maps were made. A student at the Novia university of applied sciences, Eduardo Grisales Jaramillo studying sustainable coastal management, developed a map for potato farming. He was tutored by Stefan Heinänen and Romi Rancken. The map Grisales Jaramillo created

NOVIA R & D IN BIOECONOMY

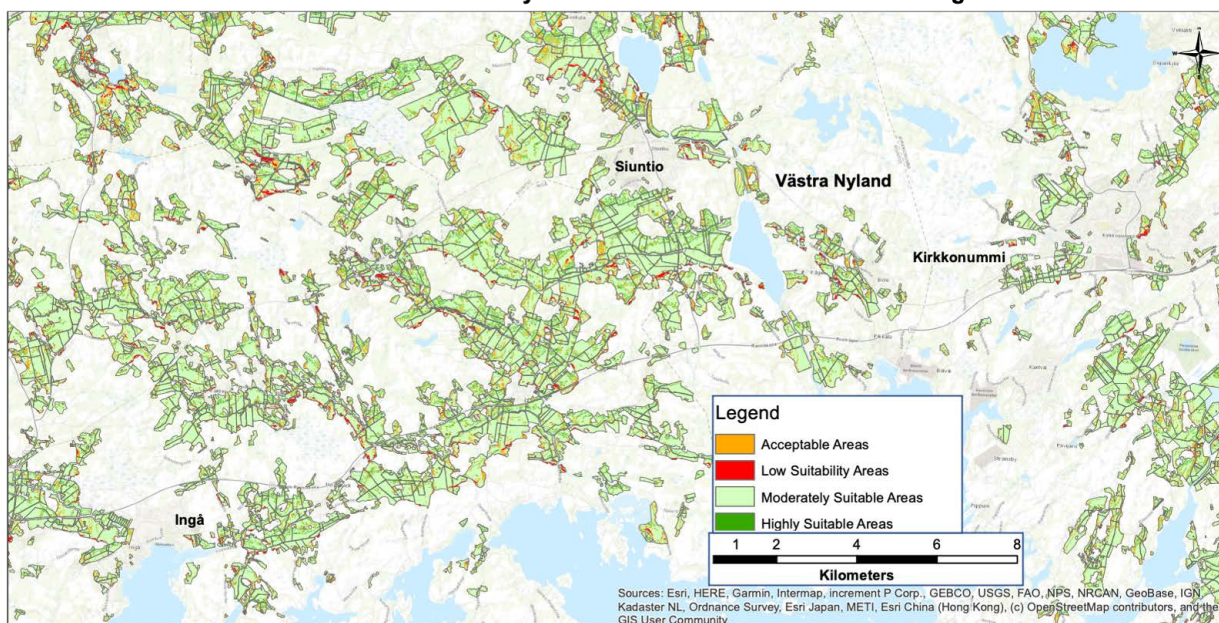
The project Matregion Nyland advanced according to the plans during 2020, despite the special circumstances due to the COVID-19 pandemic. Most of the work has been done remotely, except from some visits to performers within the worth chain in the food sector. The planned events have either been cancelled, postponed or arranged remotely, and the success of the project has partly been limited due to this.

was well suited for further development, and he was employed as a project researcher for the summer for this task.

Mapping the selling of the Nyland new potatoes

In June the covid-19 restrictions were eased, and Christos Granqvist was able to visit markets all over Nyland, to map the farmers of new potatoes. He found that the markets aren't as genuine as he had imagined. On the biggest markets, the salesmen buy their products from the wholesale trade, and hence the field research gave no deepened insight in the production of new potatoes in Nyland. Though, the further from the capital region he went and the smaller the markets were, the more likely it was to find salesmen who could name the farmers. Very few actual

Suitable Areas for Early-Potato Cultivation in the Uusimaa Region



farmers were present. Interviews with farmers of new potato, showed that only one in ten sold the potatoes themselves, beside selling in Reko-rings or at their own farms. Selling through the Reko-ring was described as very time-consuming.

Contacting representatives of the retail market, Granqvist found out that most of the super markets buy their new potatoes through the wholesale trade or from the market chains own production stock. Only some of the smaller super markets were able to get their new potatoes from local farmers.

Based on the interviews, the project concluded that the producers themselves don't have time to take care of the production as well as the sale of it, and therefore hand it on to local market salesmen. But on the markets, most of the

new potatoes came from other regions than Nyland.

Workshops

The project arranged two workshops, with the common goal to discuss problems within the worth chain. The project ordered the planning from Jannie Vestergaard. Especially from the first workshop, the project got many new ideas about processing within the chain, giving a good base for the next workshop. This one turned out to have only a few participants, but thanks to detailed interviews with those, the workshop was still useful for the project.

An application for a new project, aiming to develop waste in the primary production of the food chain, was made together with the universities Haaga-Helia, Laurea och SeAmk. The project also began mapping the producers of natural pasture meat, going through the Reko rings and contacting slaughterhouses. Being an expert on apple farming, Gun-Britt Husberg has co-worked with the project. She has mapped the apple species farmed in Nyland.

Within Nyland, two clear regions for apple farming with a commercial purpose are found: The area around Lojo (Lohja), and the part of Eastern Nyland bordering Kymmene. With the work done during the year interviewing and worksopping, the project had collected a big amount of data, and most of the autumn was spent going through and analyzing it. The project has planned to buy a graphical summary of the information. Much work is still needed to create an informative whole, suited to be handed over to others for further development.

Matregion Nyland inledde sitt verksamhetsår 2020 med att rekrytera och anställa en ny projektledare, Christos Granqvist. Koronapandemin inverkar begränsande på projektets verksamhet, men projektarbetare Eduardo Grisales Jaramillo skapade GIS-kartor över äppel- och nypotatisodling i Nyland, diverse samarbeten etablerades och Granqvist kartlade genom besök på torg och reko-försäljningspunkter direktförsäljningen och odlingen av nypotatis i Nyland. Under hösten höll man två workshops där man med aktörer kunde diskutera problem i värdekedjan. Man deltog också i en projektansökan för ett projekt som, ifall det beviljas finansiering, ska minska det svinn som uppstår i matproduktionen. Projekt-tiden förlängdes så att Matregion Nyland fortsätter in på 2021.

Smart Marina - Contemporary harbours with soft energy technology

Rasmus Karlsson

NOVIA R & D IN BIOECONOMY

The Smart Marina project has improved services while aiming to reduce environmental impact in 32 guest harbours spread across the Central Baltic Sea. Safety has been improved by educating harbour staff as well as investing in safety equipment and safer jetties. An application for more efficient visualization of harbour services has also been developed.

The final year of the project started off with a huge effort in co-operation with the project SeaStop, to market the project results so far on the ten-day boat fairs in Helsinki and Stockholm, the latter one to be cut short due to the pandemic outbreak in Europe. Despite the pandemic we were able to carry through the rest of our investment activities, also helped by the three-month prolongation of the project.

During 2020 we installed solar power plants in five harbours, with a combined nominal maximum effect of 92 kW. We also installed the last jetties in the project with new jetties in Barösund. In Kirjais, the last service building project was finished when toilets, showers and a sauna was built in an existing

building. A new experience was the modular service buildings acquired for Cafébryggan on Högsåra, with sauna-, shower-, and toilet-modules. For increased safety we also invested in three AED devices.

By the end of the year, the Smart Marina application was launched. The application includes 360-degree aerial views of the harbours in the project, with information on services and safety in each harbour. The application is available for Android and iOS. An important aspect of the project was the goal to certify project harbours in the Blue Flag program, a global certificate that demands environmentally friendly operation of the harbour and is awarded by the organization Foundation for Environmental



Barösund - Orslandet guest harbour with new jetties

Education (FEE). This task was particularly challenging in Finland as the local FEE organization was not running the program at the start of the project. However, during 2020, FEE Finland started up the process of Blue Flag certification in Finland and the project harbour Archipelago Centre Korpoström was given the possibility to apply for the certificate as the first harbour in Finland.

The project is ending in early 2021, with the final conference left on the agenda. The

project must be described as a success with improved service level in 32 harbours. Smart Marina has secured a stronger network of well equipped, modern and safe guest harbours across the Central Baltic Sea, as many investments would have been impossible without the support of the project. In many harbours this has secured operations for many years to come. We hope to see this strong network live on through more projects in the future.

Smart Marina har förbättrat servicenivån och säkerheten i 32 gästhamnar i centrala Östersjön genom investeringar i hamninfrastruktur, utbildning av personal och utvecklandet av en gästhamns-applikation. Projektet har förbättrat verksamhetsförutsättningarna för hamnarna långt in i framtiden.



VARSAINAI-SUOMEN LIITTO
EGENTLIGA FINLANDS FÖRBUND
REGIONAL COUNCIL OF SOUTHWEST FINLAND



EUROPEAN UNION
European Regional Development Fund



Circular economy

Harry Lindell

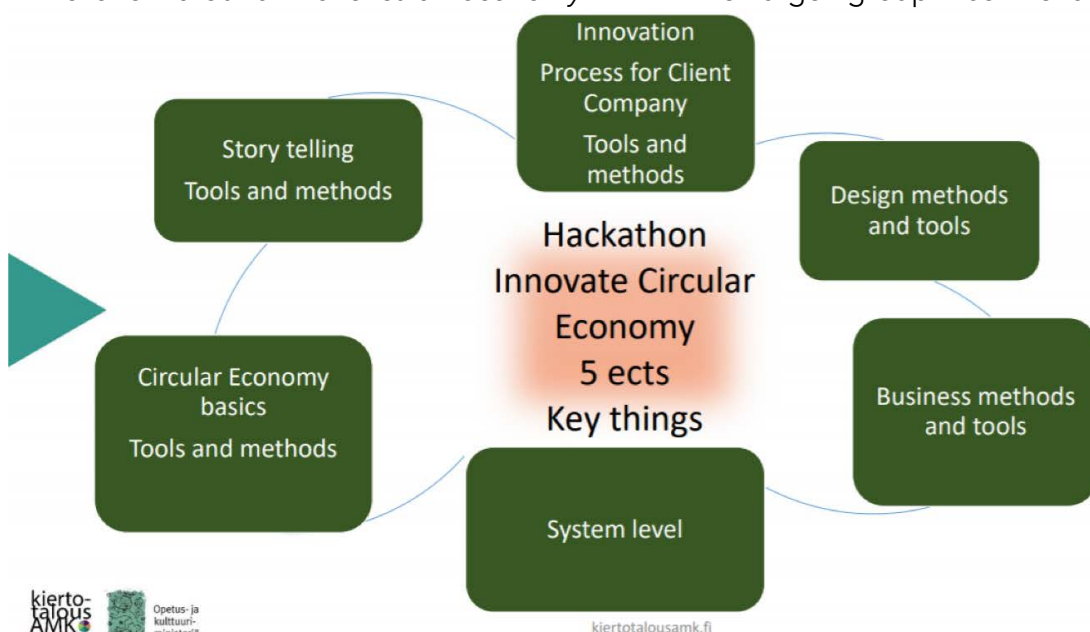
NOVIA R & D IN BIOECONOMY

The nationwide project Circular economy, aiming to renew the teaching at the Finnish universities of applied sciences regarding Finland's goal to be coal neutral in 2035, was active during 2019 and 2020. Novia took part in the project alongside 19 other universities of applied sciences in Finland, led by Lapland UAS. Harry Lindell has been the coordinator of Novia's part.

Several teachers at Novia have taken part in the pilot activities for renewing the school syllabus during the project. The areas involved are technical cycles in energy technology and environmental technology, forest studies, organic cycles, service design, and design-driven innovation based on circular economy. Some of the material, so-called nuggets, Novia was involved in producing are *Sankey diagram* and *Waste Management* jointly with Tampere UAS, *Innovative Wood-Based Materials and Products* and *A story about the life cycle of rye bread* jointly with Metropolia UAS, *Introduction to service design in cooperation* with Laurea UAS, Turku UAS, Haaga-Helia UAS, and LAB UAS, and *Design-driven innovation around the circular economy* in

cooperation with Savonia UAS and Haaga-Helia UAS. The school syllables are easily available for all universities on the common platform aoe.fi. In total, the project has produced teaching material for 235 study points.

To renew the teaching according to plan, the strategies were to find out and document the abundance of the existing cooperation between the universities, to harmonize and level up the processes regarding the teaching of circular economy at the universities, as well as to develop good praxis for cooperation with the working life. As an example of the last strategy mentioned, the project got to present itself on a development seminary led by NÅA Business Center. The target group was the decision-makers



Studying "design driven innovation", students learn to innovate system level circular economy solutions and new business possibilities in order to create positive environmental impacts .

and companies of communities in the archipelago of Southwestern Finland. Novia participated in a part of the project called the Sustainable Development Working Group, in which the publication Measures for polytechnics towards carbon neutrality and sustainability was written.

Circular economy and sustainable development are increasingly becoming a natural

part of the operation at universities of applied sciences in Finland. A common program has been approved by all of them. The benchmark is the goals for a sustainable economy set by the UN in 2015: sustainable, responsible, and carbon-neutral universities by 2030.

Det nationella projektet Cirkulär ekonomi pågick åren 2019-2020, med 19 yrkeshögskolor involverade i att kartlägga och stärka samarbetet sinsemellan, och att förnya undervisningen, i syfte att göra den ändamålsenlig med tanke på Finlands mål om kolneutralitet år 2030. Harry Lindell fungerade som projektledare för Novias del. Flera lärare medverkade också, och projektet producerade bland annat en stor mängd läromedel. Man etablerade även kontakt med lokala beslutsfattare och företagare.



GeoICT4e - Social innovations in Geo-ICT education at Tanzanian HEIs for improved employability

Romi Rancken

NOVIA R & D IN BIOECONOMY

Since August 2020 a consortium consisting of Novia UAS, University of Turku and Turku UAS, participates in a project that aims at strengthening the geospatial skills for students in Tanzanian universities. The project received funding from HEI ICI, a programme financed by the Ministry of Foreign Affairs and administered by the Finnish National Agency for Education.

The 4 year project, named GeoICT4e, aims at improving entrepreneurial skills for university students in five Tanzanian universities, skills related to geospatial sciences (GIS) and to sustainability in a broad sense.

The university sector in Tanzania grows at a rapid pace, and the millions of graduates expected to enter the workforce in the coming years cannot only rely on being employed as government officials, a typical career for previous generations of university graduates. Instead, they have to employ themselves, or develop skills that make them attractive on the job market.

University of Turku has previously implemented two similar HEI ICI projects in Tanzania, then aiming at developing the infrastructure at the universities such as GIS labs, as well as training the university staff in geospatial matters. The current project takes a step closer to the society as it builds on a learning method that we call MCL, Multi-Competence Learning, and is implemented through so called challenge campaigns, where students solve multi-faceted problems in a real world setting.

The project looks at the world through a sustainability lens, and consists of several themes, the most important being climate



A team consisting of representatives from all 8 participating universities held a project planning seminar in Morogoro, Tanzania, in February 2020.

change and its implications, geospatial technologies and ICT, innovation and entrepreneurship and natural resources management. As Novia's input is channeled through the Faculty of Bioeconomy, our main focus is on natural resources management and sustainable coastal management issues, but we will also take part in development and testing of the MCL method and other activities during the project.

Due to COVID-19, the ongoing inception face of the project had to be replanned,

without extensive travelling and face-to-face meetings. We have however been able to conduct a series of online meetings both with them and with our partners in Finland.

When the inception phase ends at the end of January 2021, there will be an updated project plan, after which we start the work with the first big task, producing 40-50 "mini-MOOCs" for use at the universities in Tanzania. All learning materials will be open sourced and made available for anyone.

Projektet GeolCT4e strävar efter att förbättra entreprenöriellt kunnande hos studerande inom branscherna för GIS och hållbar utveckling vid fem universitet i Tanzania. Universitetssektorn i Tanzania växer i snabb takt och miljoner utexaminerade förväntas komma in i arbetslivet under de kommande åren. Tidigare generationer har kunnat förlita sig på en karriär som tjänsteman inom offentliga sektorn, men nu behöver studerande utveckla färdigheter som gör dem attraktiva på arbetsmarknaden. Hållbar utveckling, klimatförändringen och dess konsekvenser genomsyrar projektet. Teman som lyftas fram är bland annat geospatial teknik och ICT, innovation och entreprenörskap samt förvaltning av naturresurser.

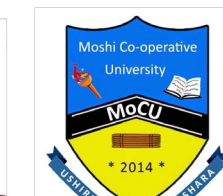
The Higher Education Institutions Institutional Cooperation Instrument (HEI ICI) supports cooperation projects between higher education institutions in Finland and the developing world. The projects support the HEIs as they develop their subject-specific, methodological, educational and administrative capacity. The programme is funded by the Ministry for Foreign Affairs of Finland and administered by the Finnish National Agency for Education.



Ministry for Foreign Affairs of Finland



FINNISH NATIONAL AGENCY FOR EDUCATION



Bondenyttn

Paul Riesinger

Praktisk samverkan bidrar till ett hållbart jordbruk

Högskoleutbildning, samhällsutveckling och arbetsliv gagnas av samarbete. Kunskap och forskning bidrar till ett produktivt och hållbart lantbruk. Samtidigt är utbytet med den praktiska verkligheten en central förutsättning för en relevant och inspirerande agrologutbildning. Bondenyttn skapar en miljö, där kunskap och erfarenheter delas mellan lantbrukare, agrologutbildningen och rådgivningen.

Skördebegränsande faktorer undersöks på gårdsnivå, på Västankvarn försöksgård, genom litteraturstudier och med hjälp av experter. Undersökningarna planeras och utförs i samarbete mellan den projektansvarige, en grupp lantbrukare och agrologstuderande. Bondenyttn medger ett deltagardrivet och variationsrikt utbildningskoncept, där arbetet utgår från lantbrukets praktiska frågor. Samarbetsparterna tillägnar sig kunskap, samtidigt som de inspireras av det gemensamma

Bondenyttn contributes to sustainable agricultural practices and participatory learning, bringing together farmers, students, teachers, extension services and research. Goals are achieved by farm studies, field trials, literature studies and personal communication. Recent activities comprehend field trials with lucerne, mapping of pea root rot, publications on soil organic carbon, and the development of carbon balances. Bondenyttn contributes to the development of agricultural practices, mobilises the resources at hand for agricultural education and endorses the social self-esteem of farmers.

Projektet Bondenyttn påbörjades våren 2018 vid agrologutbildningen på Yrkeshögskolan Novia i Raseborg. Arbetet finansieras av Finlandssvenska Jordfonden. Ansvarig för Bondenyttn är AFD Paul Riesinger, lektor i växtodling vid YH Novia.



Kartläggning av ärtrotträta och infiltreringsprov arbetet.

Lärdomarna från undersökningarna och försöken görs tillgängligt genom fältstigar, studiebesök, seminarier, föredrag och publikationer. Bondenyttn utgör en del av ett redan befintligt naturbrukskluster. Vid sidan om kunskapsnyttan och den pedagogiska nyttan resulterar samarbetet i positiva sociala effekter. Lantbrukare och agrologstuderande bekräftas i sin yrkesroll. Under 2020 sköttes fem projekt:

1. Förutsättningar för odling av lusern (Mårten Holmberg)
2. Art- och sort- samt odlingstekniska försök med lusern (Västankvarn försöksgård)
3. Förekomsten av ärtrotträta i Nyland, Åboland och Österbotten
4. Kolbindning i åkermark (litteraturstudier)
5. Utvecklingen av en växtföljdsbaserad modell för kolbalanser

Arbetsresultaten redovisades i form av examensarbeten och tidningsartiklar.

Planerade seminarier har ställts in som följd av Covid-19-pandemin.

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- Engström-Öst J. Finska viken skiftar färg. Västra Nyland, 21.4.2020.
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- Pakseresht A. Vår inställning till genädrad mat. Västra Nyland, 11.2.2020.

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Scientific presentations

Byholm, P. & Lindén, A. Storskarvens lokala predationseffekt på fiskbestånd och dess inverkan på fiskfångster. Österbottens fiskarförbund, årsmöte, Vasa 30.6.2020

Byholm, P. & Lindén, A. GPS-uppföljning av skarv i Österbotten. Österbottens regionala skarvarbetsgrupp, möte, 16.11.2020.

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Gunko R. Nutrient runoff risk, eutrophicated waters and public opinions on these: do they match? (Poster presentation). OIKOS 2020, Reykjavik, Iceland, 3-5.3.2020.

Engström-Öst J. Salinity as a driver of brackish zooplankton adaptation. (poster presentation). OIKOS 2020, Reykjavik, Iceland, 3-5.3.2020.

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Forsblom L. Phenological changes in mesozooplankton in a temperate coastal area. OIKOS 2020, Reykjavik, Iceland, 3-5.3.2020.

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Karell P. Gloger's rule on the move: climate change alters the distribution of colour polymorphism in a wild bird. OIKOS 2020, Reykjavik, Iceland, 3-5.3.2020.

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von Weissenberg E. Trade-off between reproductive effort and oxidative status as a response to warming in the marine environment. OIKOS 2020, Reykjavik, Iceland, 3-5.3.2020.

von Weissenberg E. Trade-off between reproductive effort and oxidative status as a response to warming in the marine environment. Novia Research Seminar, Novia, Raseborg, 27.4.2020.

Media appearances

Jonna Engström-Öst

Varm och regnig vinter ökar risken för algblomningar i sommar. *Radio Vega Västnyland* 23.1.2020.

Louise Forsblom

Fakta under ytan fångslar. *Västra Nyland*, 18.6.2020.

Fakta under ytan fångslar / Pinnanalainen todellisuus kiehtoo. *Hangon lehti - Hangötidningen*, 15.7.2020.

Otto Långvik

Vi kan tälja nya produkter ur ved. *Vasabladet*, 1.2.2020.

Chiara Morosinotto

Interview for the podcast *Co.Scienza* to discuss about research in biology, from maternal effects and predation risk to evolutionary ecology (in Italian):

https://open.spotify.com/episode/0bvtKb5uBOc1JsdbRYNsYM?si=dZM5Cm6MRiCAf6yEll6IUw&utm_source=copy-link



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 2020

Jonna Engström-Öst

- Conservation Biology: teaching, seminar day, abstract writing, exam
- Coastal Ecology I (field work and lab assignments)
- Research Methodology: lectures and assignments
- Sustainable Coastal Management: workshops
- Supervising PhD, MSc- and BSc-thesis projects

Otto Långvik

- Bioeconomy Innovations
- Management Systems
- Natural Resources Management
- Supervising MSc- and BSc-thesis projects

Ashkan Pakseresht

- Participatory processes and conflict management
- Supervising MSc-thesis projects

Patrik Karell

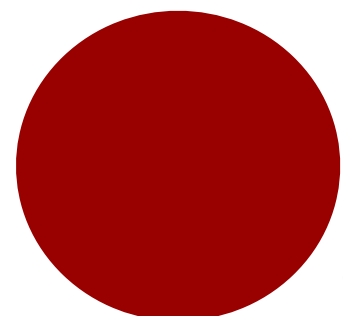
- Supervising PhD and MSc-thesis projects

Chiara Morosinotto

- Conservation Biology
- Supervising PhD and MSc-thesis projects

Ruslan Gunko

- GIS Project
- Supervising BSc-thesis projects



Novia Raseborg R&D, Personnel 2020

Senior researchers

Engström-Öst, Jonna
Karell, Patrik
Långvik, Otto
Pakseresht, Ashkan

Researchers

Byholm, Patrik
Ericsson, Peter
Morosinotto, Chiara
Otterbeck, Andreas

Associated researchers

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Gunko, Ruslan
Kohonen, Kia
Passarotto, Arianna

Perrault, Charlotte
Silvennoinen, Amanda
von Weissenberg, Ella

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Dahlberg, Ulrika
Englund, Gunnel
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Granqvist, Christos
Grisales-Jaramillo, Eduardo
Karlsson, Rasmus
Lindell, Harry
Rancken, Romi
Räisänen Jack
Söderholm-Emas, Annika

Other personell

Fred, Marianne (R&D Leader)
Fortelius, Wilhelm (Head of R&D)
Gustafsson, Pia (Project Assistant)
Isaksson, Ulrica (R&D and Administrative Assistant)
Lindblad, Ulrika (R&D Assistant)
Sandberg-Kilpi, Eva (Dean)
Tamelander, Tobias (R&D Coordinator)

The Novia Bioeconomy Research Team

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