ÁGRIP ERINDA OG VEGGSPJALDA

VISTÍS 2019 / ECOICE 2019

29.- 30. MARS 2019
HÓLUM Í HJALTADAL

VISTFRÆÐIFÉLAG ÍSLANDS

STJÓRN VISTFRÆÐIFÉLAGS ÍSLANDS

Ingibjörg Svala Jónsdóttir, Háskóli Íslands, formaður
Gísli Már Gíslason, Háskóli Íslands, gjaldkeri
Erpur Snær Hansen, Náttúrustofu Suðurlands, ritari
Tómas Grétar Gunnarsson, Rannsóknasetur HÍ á Suðurlandi, ábm. Félagaskrár
Ágústa Helgadóttir, Háskóli Íslands/Landgræðsla ríkisins), vefsíðustjóri
Jóhann Þórsson, Landgræðsla ríkisins, varamaður
Freydís Vigfúsdóttir, Háskóli Íslands, varamaður

UNDIRBÚNINGSNEFND

Ágústa Helgadóttir, Stjórn VistÍs (Háskóli Íslands/Landgræðsla ríkisins)
Bjarni Kristófer Kristjánsson, Háskólinn á Hólum
Camille Leblanc, Háskólinn á Hólum
Kári Hreiðar Árnason, Háskólinn á Hólum
Anett Reilent, Háskólinn á Hólum

FAGNEFND VISTÍS 2019

Freydís Vigfúsdóttir, Háskóli Íslands, forseti fagnefndar
Tómas Grétar Gunnarsson, Rannsóknasetur HÍ á Suðurlandi
Jóhann Þórsson, Landgræðsla ríkisins
Skúli Skúlason, Háskólinn á Hólum
Stefán Óli Steingrímsson, Háskólinn á Hólum

Mynd á forsíðu: Guðrún Lára Pálmadóttir
Umbrot og uppsetning dagskrár: Freydís Vigfúsdóttir

Föstudagur / Friday

12.00 REGISTRATION AND LUNCH

13.00 CONFERENCE OPENING

13.05 WELCOME WORDS FROM OIKOS

13.20 WELCOME WORDS FROM HOLAR REPRESENTATIVE

13.30 SESSION I – BEHAVIOURAL ECOLOGY AND CONSERVATION - chair: *Skúli Skúlason*

13:30 E1 **Intraspecific diversity and its implications for conservation**
Camille Leblanc

13.45 E2 **Territorial behaviour and population density in stream-dwelling salmonids**
Stefán Óli Steingrímsson

14.00 E3 **Link between ecological factors and boldness in Arctic charr population located in freshwater spring**
David Benhaim

14.15 E4 **Seasonal variation of invertebrate abundance and diet composition of arctic charr in an icelandic spring system**
Agnes-Katharina Kreiling

14.30 E5 **Food Availability and Diel Activity in stream-dwelling Arctic charr (Salvelinus alpinus)**
Krystal Mannion

14.45 POSTERS AND COFFEE (15 MIN)

15.00 SESSION II – EVOLUTION, ECOLOGY AND DEVELPEMENT – chair: *Bjarni Kristófer Kristjánsson*

15:00 E6 **What Arctic charr can tell us about the role of personality in speciation**.
Quentin Jean B. Horta-Lacueva

15.15 E7 **The effect of water current velocity on diel activity and growth in Arctic charr (Salvelinus alpinus)**
Michael Arthur Galloway

15.30 E8 **Monitoring salmonid populations using unmanned aerial vehicles: a case study of Arctic charr in Iceland**
Silvia Garcia Martinez

15.45 E9 **Pre-zygotic mechanisms of reproductive isolation in sympatric Arctic charr**
Kalina Hristova Kapralova

16.00 E10 **The role of ontogenetic flexibility in shaping diversity and response to a changing environment.**
Sarah Steele

16.15 LEG STRETCHER (10 MIN)

16.25 SESSION IIB - EVOLUTION, ECOLOGY AND DEVELPEMENT II – chair: *Kalina H. Kapralova*

16:25 E11 **The use of eDNA in ecology, examples from studies on freshwater springs**.
Snæbjörn Pálsson

16.40 E12 **DNA methylation in Arctic charr: Epigenetics to help understand polymorphism**
Sébastien Matlosz

16.55 E13 **Discovering the homogametic sex chromosome**
Charles C R Hansen

17:10 E14 **Studies of population structure and shell colour polymorphism in the common whelk, Buccinum undatum**
Zophonías Oddur Jónsson

17:25 E15 **The colonization of downy birch (Betula pubescens) in early succession at Skeiðarársandur south of Vatnajökull is originated from Skaftafell**
Kristinn P Magnússon

17.40 E16 **The conceptual basis and future of ecological evolutionary developmental biology**
Skúli Skúlason

17.55 ANNOUNCEMENTS

18.00 POSTER SESSION – STARTING WITH SHORT TALKS – chair: *Ágústa Helgadóttir*

19.30 SOCIAL EVENT - HÓLAR TOUR, LOPAPEYSU PARTÝ, BJÓRSETUR ÍSLANDS, LOCAL ARTIST

Laugardagur / Saturday

09:00 Invited speaker **Climate change impacts on reciprocal subsidies between freshwater and terrestrial ecosystems**
Eoin O'Gorman

09.30 SESSION III – ENVIONMENTAL CHANGE AND IMPACTS – chair: *Stefán Óli Steingrímsson*

09:30 E17 **Trichoptera species on the North-Atlantic islands with emphasis on Iceland**
Gísli Már Gíslason
09.45 E18 **Effect of overflowing water from hydropower dam on benthic macroinvertebrates**
Erlín Emma Jóhannsdóttir
10.00 E19 **Climate warming impacts competition within moss-associated bacterial communities**
Ingeborg Jenneken Klarenberg

10.15 POSTERS AND COFFEE (15 MIN)

10.30 SESSION IV – TERRESTRIAL – chair: *Jóhann Þórsson*

10.30 E20 **Intraspecific plant trait variability may contribute to plant community resistance to warming in the high Arctic**.
Ingibjörg Svala Jónsdóttir
10.45 E221 **GróLind: Assessing and monitoring vegetation and soil resources in Iceland**
Bryndís Marteinsdóttir
11.00 E22 **Fyrstu framvindustig víðáttumesta birkiskógar á Íslandi?**
Kristín Svavarsdóttir
11.15 E23 **Why is it so hard to decide what (and how) to measure? Towards a standard protocol for measuring invertebrate herbivory in tundra**
Isabel C Barrio
11.30 E24 **Hið ósnortna Ísland - vöktun jökulskerja í Breiðamerkurjökli**
Starri Heiðmarsson
11.45 E25 **Between ice and ocean; Effects of Great Skua (Stercorarius skua) and Arctic Skuas (Stercorarius parasiticus) on primary succession at retreating Breiðarmerkurjökull glacier, SE-Iceland.**
Sigurlaug Sigurðardóttir

12.00 LUNCH

13.00 Invited speaker **Þróunarvistfræðileg nálgun við vernd fiskistofna: dæmi úr íslenskum strandsjó.**
An evolutionary ecology approach to conserving fish populations: examples from Icelandic nearshore habitats
Guðbjörg Ásta Ólafsdóttir

13.30 SESSION V – MONITORING – chair: *Freydís Vigfúsdóttir*

13:30 E26 **Eldey – a UAV-based gannet population estimate**
Sindri Gíslason
13.45 E27 **Vöktun bjargfugla á Íslandi**
Þorkell Lindberg Þórarinsson
14.00 E28 **Explaining population dynamics in a small reindeer sub-heard in East Iceland 2002-2018**
Rán Þórarinsdóttir
14.15 E29 **The decline of Great Skua on Breiðamerkursandur**
Lilja Jóhannesdóttir
14.30 E30 **The use of the marine snail Nucella lapillus as an indicator of current organotin pollution in Iceland**
Halldór Pálmar Halldórsson

14.45 POSTERS AND COFFEE (15 MIN)

15.00 SESSION VI – MARINE BIOLOGY AND ECOLOGY – chair: *Sunna Björk Ragnarsdóttir*

15.00 E31 **Potential dispersion of the invasive Ciona intestinalis around Iceland**
Joana Micael

15:15 E32 **Biological responses to contaminants in three-spined stickleback (Gasterosteus acueleatus) from polluted sites in Reykjavik**.
Hermann Dreki Guls

15.30 E33 **Sea lice in Icelandic coastal waters**
Eva Dögg Jóhannesdóttir

15.45 E34 **Microbe in Icelandic Marine Environments**
Clara Jégousse

16.00 E35 **Killer whale associations with herring and mackerel in Iceland**
Filippa Samarra

16.15 LEG STRETCHER (10 MIN)

16.25 E36 **Linking foraging ecology and population declines in Atlantic puffins**
Erpur Snær Hansen

16.40 E37 **Soundscape dynamics at breeding sites of the Atlantic puffin (Fratercula arctica) in northeast Iceland**
Adam Smith

16.55 E38 **Hearing of the Atlantic puffin, Fratercula arctica and a common murre, Uria aalge measured in Northeast Iceland**
Marianna Rasmussen

17.10 E39 **Northern bottlenose whales in a pristine environment respond strongly to close and distant navy sonar signals**
Paulus Jacobus Wensveen

17.25 E40 **Comparison of the call repertoires of killer whales (Orcinus orca) between locations within Iceland and between Iceland and Norway**
Anna Selbmann

17.40 VISTÍS ANNUAL GENERAL MEETING - RESOLUTION AND STRATEGIES (30-45 MIN)

18.15 FREE TIME (BEER CLUB, SWIMMING POOL, HÓLAR HISTORICAL INTRODUCTION FOR INTERESTED)

20.00 CONFERENCE DINNER

VEGGSPJÖLD / POSTERS

P01 **Discovery and distribution of Mediopyxis helysia in Breiðafjörður, West Iceland**
Erla Björk Örnólfsdóttir, Sólveig R. Ólafsdóttir, Agnes Eydal and Karl Gunnarsson

P02 **Arctic tern chick mortality in Iceland: influence of dietary composition and provisioning rates**
Freydís Vigfúsdóttir, Tómas G. Grétarsson and Jennifer A. Gill

P03 **Microplastics in blue mussels (Mytilus edulis) from coastal sites in Iceland**
Halldór Pálmar Halldórsson and Hermann Dreki Guls

P04 **The effects of rearing environment on the growth and metabolic rate of lumpfish (Cyclopterus lumpus)**
Amber Monroe and Helgi Thorarensen

P05 **Colonization of downy birch in early succession**
Guðrún Óskarsdóttir , Hulda Margrét Birkisdóttir , Kristín Svavarsdóttir and Þóra Ellen Þórhallsdóttir

P06 **Growth and age of Downy Birch on Skeiðarársandur: Age and size distribution and growth patterns of a colonising population of downy birch on a early successional outwash plain**
Hulda Margrét Birkisdóttir, Guðrún Óskarsdóttir, Ólafur Eggertsson, Þóra Ellen Þórhallsdóttir Háskóli Íslands and Kristín Svavarsdóttir

P07 **A new method in locating Arctic charr spawning grounds using a combination of diving and genotyping**
Lieke Ponsioen, Jónína Ólafsdóttir and Kalina Kapralova

P08 **Origin of the common eider, Somateria mollissima in the Faroe Islands and Iceland**
Elisabeth Knudsen, Jón Einar Jónsson, Snæbjörn Pálsson

P09 **Hlutverk gulvíðis og loðvíðis í frumframvindu gróðurvistkerfa**
Vigdís Freyja Helmutsdóttir, Þóra Ellen Þórhallsdóttir og Kristín Svavarsdóttir

ÁGRIP / ABSTRACTS

Plenaries:

I

Climate change impacts on reciprocal subsidies between freshwater and terrestrial ecosystems

Eoin O'Gorman

Dr Eoin O'Gorman is a lecturer in ecology at the University of Essex. He did his PhD at University College Cork in Ireland and has been a research fellow at University College Dublin and Imperial College London. His research is focused on understanding the impacts of global change across multiple levels of biological organisation, from individuals to food webs. He has undertaken research within this general framework in marine, freshwater, and terrestrial ecosystems, seeking common responses to environmental stressors across these different ecosystem types. He seeks simple rules that lead to stabilising structures, with a particular focus on body size as a key functional attribute that drives interactions and self-organisation in food webs. At VistÍs 2019, he will deliver a talk about "Climate change impacts on reciprocal subsidies between freshwater and terrestrial ecosystems".

II

Þróunarvistfræðileg nálgun við vernd fiskistofna: dæmi úr íslenskum strandsjó.
An evolutionary ecology approach to conserving fish populations: examples from Icelandic nearshore habitats

Guðbjörg Ásta Ólafsdóttir

Dr Guðbjörg Ásta Ólafsdóttir is a research scientist and director at the University of Icelands Research Centre of the Westfjords. She did her PhD at the University of St Andrews in Scotland and a was previously a research fellow at the University of Iceland. Guðbjörg has broad interests in evolutionary ecology, with a focus on how ecological, environmental and anthropological factors pattern biological variation between and within animal populations. In recent years her research has primarily focused on global change and anthropological effects on diversity of commercial fish populations as she seeks to understand how variation within populations, and between individuals, factors into management and conservation of fish stocks. At VistÍs 2019, she will deliver a talk about "An evolutionary ecology approach to conserving fish populations: examples from Icelandic nearshore habitats“.

FÖSTUDAGUR / FRIDAY

E1

Intraspecific diversity and its implications for conservation

Camille A. Leblanc [1], Skúli Skúlason [1], Kevin Parsons [2], Kimmo Kahilainen [3], Colin Bean [4], Bjarni Kristjánsson [1] and Colin Adams [5]

1. Hólar University College, Department of Aquaculture and Fish Biology.
2. University of Glasgow, Institute of Biodiversity Animal Health and Comparative Medicine.
3. Inland Norway University of Applied Sciences, Evenstad.
4. Scottish Natural Heritage, Ecosystems and biodiversity policy and advice, Inverness.
5. University of Glasgow, Scottish Centre for Ecology and the Natural Environment.

In various taxa, evidence for significant variation in genotypes and phenotypes within a species is rapidly accumulating. Such intraspecific diversity is recognised as an important source of biodiversity, as are the ecological, evolutionary, ande developmental mechanisms and processes shaping it. Intraspecific diversity has been shown to buffer species against rapid environmental changes, create evolutionary potential for populations, and shape communities and ecosystems. Although researchers and policy makers have acknowledged below-species-level diversity, conservation efforts are mostly directed towards focal species, overlooking the ecological and evolutionary importance of intraspecific variation.

In an attempt to bridge this gap, we propose a focus on a multi-level approach in conservation. We suggest practical guidelines to promote an adequate monitoring of intraspecific diversity, which combined with an ecosystem approach in conservation could greatly improve the power and success of conservation strategies. Taking actions to fine tune how we conserve biodiversity is of particular relevance across the Arctic regions, where many changes in environmental, ecological and evolutionary processes are occuring faster than elsewhere.

This talk has been developed from the outcome of a panel discussion at the Arctic Biodiversity Congress 2018, held in Rovaniemi Finland. All authors participated equally in the discussion.

Keywords: conservation biology, environmental change, eco-evo-devo, policy making

E2

Territorial behaviour and population density in stream-dwelling salmonids

Tegund framlags: Oral presentation / fyrirlestur

Flytjandi framlags: Stefán Ó. Steingrímsson[1]; Laura K. Weir[2]; James W.A. Grant[3]

Starfsstöð: [1]Hólar University College; [2]Saint Mary´s University; [3]Concordia University

Ágrip: Territorial behaviour plays a major role for the population ecology of stream-dwelling salmonids, and is affected by a range of ecological variables, such as body size, food availability and population density. In this study, we collected data on several components of territorial behaviour in young-of-the-year (YOY) salmonids from 26 published studies and examined how these were associated with population density. In short, various aspects of territorial behaviour were strongly associated with population density. First, as expected, territory size decreases with increasing population density. Second, at low population density, YOY salmonids use a higher number of foraging stations within their territories, i.e. they use multiple central-place territories. Third, as population density increases, territorial fish attack intruders more frequently and from a shorter distance. Finally, a clear difference in territorial behaviour emerged between experimental laboratory studies (high density) and observational field studies (low density). Although individual studies have demonstrated the effect of population density on territoriality (and vice versa), this review examines these associations across a wider range in population density and ecological conditions than previously possible. We will discuss how these findings contribute to our understanding of the way territoriality shapes the population ecology of stream salmonids.

Lykilorð: Territory size, space use, aggression, population regulation, rivers

E3

Link between ecological factors and boldness in Arctic charr population located in freshwater spring

Benhaïm, D[1]., Kreling, A.K.[1], Leblanc, C.A.L.[1], Kristjánsson,, B.K.[1]

1: Hólar University College, Department of Aquaculture and Fish Biology

Ecological factors can shape the evolution of individual differences in animal personality i.e.consistent individual differences in the same behaviour across time and contexts. The link between ecological factors and fish personality has been seldom studied especially in Arctic charr (AC), a species that evolves rapidly and show adaptation and morph formation in relation to habitat and food resources. This work is part of a bigger project that aims at studying the dynamics of aquatic food webs in relation to seasonal timing in an Icelandic freshwater spring, a supposedly stable environment.

The project was conducted in the spring area of the small stream Skarðslækur in Holt og Landssveit in South Iceland. The site was processed 4 times between May and October 2017. Small benthic AC were collected in the spring sources and released for mark-recapture studies. Fish were weighted, measured, pictured for morphometric analysis, their stomach contents were sampled, fin clip sampling for genetic analysis was carried out. Invertebrate samples were collected in the source openings to estimate prey availability and abundance in the habitat. Physicochemical parameters were also recorded. On the last sampling date, 90 fish were captured and transported to the lab for personality traits measurement. Specifically, each individual was assessed twice with a one-week interval for boldness using an open-field test with a shelter. After observation fish were sacrificed and dissected for sex determination, gut microbiome analysis, otolith extraction for age estimation. Here we present some preliminary results showing evidence for personality traits in this AC population and we examine the potential links between boldness and ecological factors.

Key words: boldness, shelter, personality, spring, morph.

E4

Seasonal variation of invertebrate abundance and diet composition of arctic charr in an icelandic spring system

Agnes-Katharina Kreiling[1,2,*], Eoin O'Gorman[3], Jón S. Ólafsson[4], Snæbjörn Pálsson[2], and Bjarni K. Kristjánsson[1]

[1]Hólar University College, Hólar [2]University of Iceland, Reykjavík [3]University of Essex, UK [4]Marine and Freshwater Research Institute, Reykjavík

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The seasonal dynamics of invertebrate abundance and diet composition of fish as top predators was studied in the thermally stable environment of freshwater springs. We conducted a mark-recapture study on small benthic Arctic charr (Salvelinus alpinus) in the spring sources of a stream in South-Iceland, and sampled their stomach contents repeatedly over the course of a year. In addition, benthic invertebrate samples were taken at each sampling occasion to estimate the invertebrate availability in the habitat.

The temperature logger left in the spring measured a very constant temperature of around 5.4°C during the whole year. This confirmed that spring sources are very stable habitats in regards to their physical and chemical properties. It furthermore provided us with a semi-controlled experimental setting, in which the only variable changing during the course of the year was primary production and along with that phenological succession of the invertebrate community in the spring.

Among a total of 635 processed fish, 55 were recaptured, some of them several times. Recaptured fish were usually re-captured at the same locations of the sampling area, which suggests site fidelity of fish in this system. Seasonal variation in invertebrate availability was reflected in the composition of prey items in the Arctic charr stomachs. While Chironomidae larvae were the most common prey items all year round, Plecoptera nymphs were most abundant in May, and Ostracoda and groundwater Amphipoda were more common during the wintermonths. The results indicate a clear seasonal shift in the diet of Arctic charr in the spring system, and lay the ground for future studies on spring food webs.

Keywords: springs, invertebrates, seasonality, Arctic charr, diet composition

E5

Title: Food Availability and Diel Activity in stream-dwelling Arctic charr (Salvelinus alpinus)

Presenter (and co-authors) and affiliations: Krystal Mannion[1], Coralie Delarue[1], Jeroen Koolmees[2], David Benhaim[1], Stefán Óli Steingrímsson[1]

1. Hólar University College, Department of Aquaculture and Fish Biology, 2. HAS University of Applied Sciences

Food Availability and Diel Activity in stream-dwelling Arctic charr (Salvelinus alpinus)

This project examines how intraspecific competition for food may shape diel activity of juvenile Arctic charr (Salvelinus alpinus). In a field experiment, 64 fish were tagged and assorted into 8 enclosures exposed to either high or low food availability, with a 47.7% reduction of mean drift density (prey/m³) between treatments. All fish were monitored for six 24hr cycles, over two weeks, during which diel activity and environmental conditions were recorded. Individuals were then tested for behavioral variation (i.e. personality) in laboratory test arenas (open field, shelter emergence, and sociability). Overall activity rates were larger in the high food (mean=69%) than the low food treatment (mean =60%), specifically at times 0:00, 9:00, and 12:00. Activity was higher at night (mean = 75%), than during the day (mean=60%). Fish growth did not differ significantly between the high (SGR = 0.27%/day) and the low (SGR = 0.09%/day) food treatment, but more active fish grew faster than less active ones. Neither activity rate nor growth rate were related to any of the personality traits measured. Coupled with previous studies, our results suggest that the association between diel activity and food availability may be more complex than previously thought and depend on ecological conditions.

E6

What Arctic charr can tell us about the role of personality in speciation.

2. Quentin J.-B. HORTA-LACUEVA1, David BENHAÏM2, Camille A.-L. LEBLANC2, Sigur.ur S. SNORRASON1, Alia DESCLOS2, Kalina H. KAPRALOVA1

1 Institute of Life and Environmental Sciences, University of Iceland. Askja - Náttúrufræðihús Sturlugötu 7,101 Reykjavík, Iceland.

2 Department of Aquaculture and Fish Biology, University of Hólar. 551 Sau.árkrókur, Iceland.

Natural selection against hybrids can be an important driver of reproductive isolation between populations adapting to different habitats. Animal personality (differences between individuals in their behaviour which remain consistent across time and contexts) has been proposed to affect these divergence processes. Yet, little is known about the importance of personality in this respect, nor about its potential associations with other behavioural and non-behavioural traits. In the present study, we explore the possibility that heritable components of personality could differ between populations facing divergent selection, possibly affecting hybrid viability. We focus on two sympatric morphs of Arctic charr, Salvelinus alpinus (a planktivorous- and a small benthivorous morph) from Thingvallavatn, Iceland. In a common-garden experiment, we tested whether hybrids differ from parental types in the distribution of personality traits and how this correlates with ecologically relevant behavioural- (feeding behaviour) and non-behavioural traits (yolk-sac shape and resorption, head morphology, growth rate). Preliminary results suggest (1) differences in personality between morphs and (2) inconsistencies in the personality traits of hybrids as an indication for their reduced fitness. The next step will be to investigate how potential associations between personality and other behavioural, developmental and morphological traits may be linked to the viability of hybrids.

Key-words: Speciation, animal personality, Arctic charr, morphs.

E7

Title: The effect of water current velocity on diel activity and growth in Arctic charr (Salvelinus alpinus)

Presenter (and co-authors) and affiliations: Michael A. Galloway[1], Krystal Mannion[1], Helgi Thorarensen[1], Stefán Óli Steingrímsson[1]

1. Hólar University College, Department of Aquaculture and Fish Biology

Type: TALK

Key words: circadian rhythms, habitat use, streams, salmonids

Please state clearly if this is a student presentation: STUDENT PRESENTATION

The effect of water current velocity on diel activity and growth in Arctic charr (Salvelinus alpinus)

Diel activity patterns can influence food intake and fitness of salmonid fish in streams. In this study, we examine how diel activity and growth of stream-dwelling Arctic charr vary from slow-to fast running stream habitats. In a two-week field study, 60 fish were weighed, measured, and randomly assigned into six enclosures under slow (4 cm/s), intermediate (10 cm/s), or fast (18 cm/s) water current velocities. All individuals were monitored for five, 24-h cycles, during which diel activity and environmental conditions (water current velocity, water temperature, light intensity, and depth) were measured. All individuals were then measured in the laboratory for metabolic rate (resting, maximal, and aerobic scope) by estimating oxygen consumption via flow-through respirometry. Initial field results show no differences in mean activity rates (slow = 63%, intermediate = 55%, fast = 47%), but significant increases in specific growth rates from slow (SGR= -0.0003%/day) and intermediate (SGR = 0.005%/day) to fast (SGR=0.013%/day) waters. Interestingly, our results suggest that even though Arctic charr are generally believed to prefer slow waters, they may grow more efficiently in faster habitats. Further analyses will examine whether diel activity and growth relate to individual differences in metabolic rate and scope.

E8

Title: Monitoring salmonid populations using unmanned aerial vehicles: a case study of Arctic charr in Iceland

2.Presenter: Silvia Garcia Martinez,
Co-authors: Benjamin David Hennig and Kalina H. Kapralova

Salmonids are very susceptible to environmental changes and any shift in environmental conditions can lead to population decline or even population collapse. Monitoring the activities at their spawning grounds and more specifically their redds (salmonid nests) over time will help understand the population dynamics of salmonid species and subsequently, create strategies for species conservation. However, basic and costly methodologies like observations or manual counting to estimate the number of active redds are difficult and involve potential errors of interpretation. The goal of this study is to develop a reliable and efficient remote sensing protocol to aid future research and monitoring efforts with identifying changes in salmonid redd density. The study focuses on the spawning grounds of Arctic charr (Salvelinus Alpinus) in Thingvallavatn and Ellidarvatn (Iceland), two lakes with different environmental characteristics which allows for testing and comparing various classification algorithms. Data were collected by an aerial drone image survey during July and November of 2018, using a low-cost unmanned aerial vehicle (UAV) with standard visible-light images (red, green, blue spectral bands) from a digital camera sensor. We applied advanced algorithms of semi-automatic remote sensing image analysis and classification methods and we identified the spawning grounds of Arctic charr and compared the results of the two study areas to establish a procedure for future applications. The results indicate that UAV systems are suitable for environmental monitoring of shallow water in lakes in Iceland. However, several environmental conditions have to be kept in mind while obtaining the images such as sun angle, cloud cover, water clarity, and wind speed. The classifications in this study reached overall accuracies of up to over 90 per cent while detecting the actual Arctic charr redds reached accuracies of 72 to 76 per cent.

5. key words: Salmonids, monitoring, UAV

E9

Title: Pre-zygotic mechanisms of reproductive isolation in sympatric Arctic charr

Kalina H. Kapralova1 , Jónína Herdís Ólafsdóttir2 , Quentin Horta-Lacueva1 , Jóhann Gar›ar fiorbjörnsson2 , Sigur›ur S Snorrason1
1 University of Iceland, Life and Environmental Sciences
2 Hafrannsóknastofnun - rannsókna- og rá›gjafarstofnun hafs og vatna
Type: talk
Abstract:
The evolution and maintenance of reproductive barriers is a central topic in evolutionary biology as this is fundamental part of the process of speciation. The Arctic charr (Salvelinus alpinus) of Thingvallavatn is ideally suited for studies of divergence and evolution of reproductive barriers: i) it has young evolutionary history, and ii) it has diverged into four morphs with distinct variation in life history characteristics, behavior and trophic morphology, suggesting rapid adaptive diversification, possibly followed by or causing build-up of reproductive barriers. In this project we focused on the two smallest morphs a planktivorous (PL) and small benthic charr (SB), which have diverged along the limnetic (open water)-benthic (lake bottom) ecological axis. The central hypothesis underlying our investigation is that the reproductive isolation between SB and PL charr is partly due to differences in the exact timing of spawning (i.e. time of the day), precise spawning location and/or mating behavior. To address our hypothesis we are using a combination of gill net surveying of the spawning grounds, in situ exploration of the spawning grownds by diving, night filming in the wild, molecular techniques and laboratory experiments. In this presentation I will show some exciting preliminary findings and discuss the difficulties of studying pre-zygotic barriers of a noth temperate fish species having the audacity of mating in the middle of the night in October in Iceland.

Key words: pre-zygotic barriers, speciation, Arctic charr, diving

E10

The role of ontogenetic flexibility in shaping diversity and response to a changing environment.

Sarah Steele and Arnar Pálsson

University of Iceland

Arctic charr (Salvelinus alpinus) is a widespread, highly plastic, and polymorphic organism displaying significant diversity in body size, morphology, diet, life history, and behaviour throughout its range. Following the arrival of Arctic charr in Iceland approximately 10,000 years ago, the anadromous charr morph radiated into a variety of morphological forms, ecological roles, and habitats. One hypothesis is this diversity can be explained by developmental plasticity, enabling rapid evolution in response to environmental change. Morphological divergence can be experimentally induced, allowing the study of plasticity within and across morphs in response to environmental stimuli. Little is known about the developmental flexibility of anadromous populations or their ability to respond to environmental change. Furthermore, the effects of hybridization on responses and survival are poorly understood. Using a common-garden rearing experiment, morphological response to differing diet treatments within and across morphs and their hybrids will be measured. Results from this study can be used to understand sensitivity of certain life stages, populations, or morphs to variation in food availability. This study will also provide further knowledge of how developmental flexibility may allow charr and other organisms to respond to direct, rapid modifications of environment or indirect modifications through climate change.

E11

The use of eDNA in ecology, examples from studies on freshwater springs.

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Studies of eDNA metabarcoding provide a valuable addition to studies on species diversity and have proven in some cases to give a good estimate of relative abundance of different species in freshwater, marine and terrestrial environments. In this talk I will present the method and applications of eDNA metabarcoding in ecology, conservation, invasion biology and biomonitoring. Application of the method to assess diversity in freshwater springs, mainly along the volcanic zone of Iceland have revealed a large number of taxa, including bacteria and unicellular eukaryotes, but also a wealth of other species including fungi, diatoms, nematoda and some arthropods and fish. Diversity patterns are currently being analysed, but the stability of the environment may have resulted in similar species composition where dispersal between areas may override any isolation caused by geographic distance. Such patterns are though species dependent. Analyses of different groups of species assemblages will be presented.

Fyrirlestur, flytjandi. Snæbjörn Pálsson

Lykilorð:
diversity, DNA, methodology, monitoring, biota

E12

DNA methylation in Arctic charr: Epigenetics to help understand polymorphism

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Arctic charr (Salvelinus alpinus) is a polymorphic cold-water fish species belonging to the Salmonidæ family. In Iceland, Salvelinus alpinus is found in many places, but in Lake Thingvallavatn it displays remarkable morphological variation, in particular in terms of head and trophic apparatus development. The research team led by Professor Sigur›ur S. Snorrason has been working on understanding the reasons behind these morphological differences for years now, and some molecular pathways and gene expression differences have been highlighted recently. The first part of this PhD project was to highlight DNA methylation differences during early development between those morphotypes. To do so, Reduced Representation Bisulfite Sequencing was used, allowing for identification of new candidate genes that might be responsible for the different phenotypes occurring in this species.

E13

Discovering the homogametic sex chromosome

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†Presenter

Ecological research has many different possibilities, aspects and possible combinations with other research areas; population genetics, conservation genetics or genetics on a single species in an ecological setting. When doing these species-specific forms of research, it is often necessary to know the composition of the species genome you´re working on, e.g. for assessing negative effects of inbreeding. Some genome parts may display unwanted signals or infer unwanted biases in the analysis. But the necessary knowledge of the desired genomes is not always at hand, due to lack of prober or incomplete genomic references when working on non-model organisms.
Here we introduce a method for finding the homogametic sex chromosome, of non-well studied organisms. As a model organism we use the white-tailed eagle (haförn). Our approach makes use of, and require, an exciting reference genome (of course with no sex chromosome annotation), which is theoretically the genome we assign the sex chromosome to. The approach makes use of theoretical allele frequency difference in the sex chromosome between males and females, the mapping of the reference to an exciting well studied reference and SNP-loading from a Principal Component Analysis.

Keywords: genome composition, method, genetics

E14

Studies of population structure and shell colour polymorphism in the common whelk, Buccinum undatum

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The common whelk, Buccinum undatum, exhibits variation in several morphological traits (i.e. shell color, shape, thickness) over small geographical distances. Whilst common whelk is found throughout the North Atlantic, the shell colour variation observed in West Iceland (brown, orange, yellow, pink, green, white and striped) far exceeds that typically observed across the species wider distribution (brown, orange, striped). In order to determine whether Iceland's unique shell diversity is the result of variation in genetic or regulatory factors, RNA sequencing experiments were undertaken. In order to identify the genetic factors determining the morphological variation we need to separate associations that are due to population structure. Thus an in-depth RAD sequencing study was conducted in parallel, assessing the population patterns of the common whelk within Breiðafjörður and across the North-Atlantic. A general overview of the research project will be presented with emphasis of RADseq analysis of population strutcture.

E15

The colonization of downy birch (Betula pubescens) in early succession at Skeiðarársandur south of Vatnajökull is originated from Skaftafell

2
Kristinn P. Magnússon1,2, Snæbjörn Pálsson3, Þóra Ellen Þórhallsdóttir3, Kristín Svavarsdóttir4,

1Náttúrufræðistofnun Íslands, 2Háskólinn á Akureyri, 3Háskóli Íslands, 4Landgræðslan

3 Talk

4
Since a glacier outwash, three decades ago, downy birch (Betula pubescens) has colonized Skeiðarársandur, in front of a retreating glacier in south Vatnajökull, SE Iceland. In this study, we characterized and compared the genetic composition of the recent birch colony at Skeiðarársandur (N=12), with three neighboring woodlands in the area, namely Núpsstaðarskógur (N=12), Bæjarstaðarskógur (N=12), and Skaftafell (N=11) that are separated by a distance (12-20km) and glacial rivers.

For the genetic analysis we used Genotyping by Sequencing (GBS, LGC, Germany), a method of choice for high throughput discovery of SNPs and simultaneous genotyping in multiple DNA samples. It combines restriction enzyme-mediated complexity reduction (PstI-ApeKI) with the high-throughput sequencing capacity of Illumina NextSeq 500 V2 to score random markers across an entire genome. The results consisted of 3 million reads per individual providing 8.618 SNPs with the lower allele frequency > 5%.

Analysis of the data showed clear genetic divergence among the three woodlands Núpsstaðarskógur, Bæjarstaðarskógur, and Skaftafell. Judging from the genetic composition, the recent birch colony in Skeiðarársandur coincided with Skaftafell. Our results support the hypothesis that the origin of the recently colonized birch in Skeiðarársandur is in the birch woodlands of Skaftafell.

5
Keywords: population genetics, GBS, NGS, SNP,

E16

The conceptual basis and future of ecological evolutionary developmental biology

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Oral presentation

Key words: ecology, evolution, development, integration, processes

Ecological evolutionary developmental biology (eco evo devo) studies the origin and maintenance of biological diversity in an integrative way. Here, we will explore the conceptual basis and history of eco evo devo and discuss its future implications.

Among the novel messages from this conceptual approach is that in order to understand better the generation and maintenance of biological diversity the reciprocal effects among ecological-, evolutionary and developmental processes need to be continuously considered. This calls for a closer examination of e.g.: 1) the nature of organism-environment relations, including better understanding of what we mean by the term 'environment'; and 2) how patterns and processes become functional and meaningful, for example through signaling and sensitivity among cells and tissues in the developing organism, or more broadly among interacting factors in ecological communities. Advances in developmental genetics and studies of phenotypic plasticity along with broader understanding of heredity, greatly facilitate future studies of eco evo devo.

LAUGARDAGUR / SATURDAY

E17

Trichoptera species on the North-Atlantic islands with emphasis on Iceland

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Biological diversity of the Arctic has been shaped by the Pleistocene glacial periods. Species have diverged in allopatric areas during prolonged periods and expanded their distribution following the retreat of the glaciers. Genetic patterns of reflect these climatic impacts.

Nine Icelandic Trichoptera species are of Palaearctic origin, but three species have a Holarctic distribution.

Origin of two species, the Palaearctic Potamophylax cingulatus and the Holarctic Apatania zonella and the variation of the COI gene of the mtDNA in Iceland and from their distribution ranges of the species were studied. In P. cingulatus, which colonized Iceland during the 20th century, no variation was detected in the Icelandic population, and the flies were closely related to flies from the Faroes. The Icelandic population of A. zonella, a species with highly skewed sex ratio was analysed both for the COI gene and three nuclear genes. The genetic patterns revealed two lineages, one Nearctic and other Palearctic which diverged during last Ice Age from the Bering Strait area. Specimens from Alaska and Yukon, showed high diversity.

The distribution of the Palaearctic species indicate they are from Scandinavia and Norther Europe, but the two other Holarctic species need further studies on their origin.

E18

Effect of overflowing water from hydropower dam on benthic macroinvertebrates

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Fyrirlestur

Abstract

Overflowing water from hydropower dams and reservoirs to river systems causes large quantities of fine sediment travelling downstream with significant impacts on ecosystems. Kárahnjúkar Power Plant is the largest hydropower project in Iceland. Every year since 2007 glacial water from Hálslón reservoir flows over Kárahnjúkar dam into the glacier river, Jökulsá á Dal, in late summer or autumn. The aim of this study was to investigate ecological impacts downstream of overflow water on benthic macroinvertebrates and algae. Sampling was carried out before (July) and after (October) overflow at seven locations, five in Jökulsá á Dal and two in control rivers. Our results demonstrated that density and diversity of benthic invertebrates was significally lower in October after the overflow than in July closest to the dam. At two control sites in tributaries the density was significally higher in October than in July. However, recolonization of benthic invertebrates in Jökulsá á Dal seems to be relatively fast after overflow. The dominating invertebrate groups before and after the flow were Chironomidae and Simuliidae. Redundancy analysis (RDA) revealed that food sources for the dominating invertebrate groups, i.e. fine particular organic matter, chloropyll a as well as water temperature explained 54% of the variance in the species composition in the rivers.

Keywords: Hydropower dam, overflow water, benthic macroinvertebrates

E19

Climate warming impacts competition within moss-associated bacterial communities

2. Presenter (and co-authors) and affiliations
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Mosses contribute substantially to biomass in northern ecosystems. They play an important role in terrestrial carbon storage, due to their recalcitrant tissues and via interactions with microorganisms. These moss-associated microorganisms also contribute to nitrogen fixation, providing soil nitrogen input. Current knowledge of the moss-associated microbiomes and their role in biogeochemical cycles is sparse. Addressing this knowledge gap is especially important in the light of climate change. We investigated the diversity of and network interactions within moss bacterial communities under conditions of a warming climate. Samples of the moss Racomitrium lanuginosum were collected in warmed and control plots in an Icelandic heath. DNA and RNA were co-extracted and 16S rRNA and 16S rDNA amplicons were sequenced with Illumina MiSeq. Spearman correlations between the abundances of OTUs were used to build correlation networks.
The richness and diversity of the most abundant taxa increased under warming, as well as the amount of negative correlations in the networks. The increase in competition might be triggered by an increase in niche-overlap, which is a results of increased species richness. Indicator OTUs for the warmed or control treatment were more likely to be connected in the networks. These OTUs co-oscillate with warming. The increase in competition under warming can counteract these co-oscillations and promote stability.

5. Key words (max 5)
microbial ecology, network analysis, climate change, bryophytes

E20

Intraspecific plant trait variability may contribute to plant community resistance to warming in the high Arctic.

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Climate warming is happening more rapidly in Arctic tundra than in other biomes. Because small changes in temperature constitute greater relative change in the thermal balance at high latitudes than lower, high Arctic plants and plant communities were initially expected to respond more strongly to temperature increase than in the low Arctic. Although this is the case in terms of phenology, most studies show the opposite for plant community composition: in most low Arctic ecosystems, plant communities show significant shift in species composition while high Arctic plant communities show no or very slow responses. There may be several reasons for the slower community responsiveness in the high Arctic, such as smaller species pools, migration barriers and large climate variability causing high intraspecific variation.

We used a combination of traditional analysis of plant community composition and a trait based approach to assess responses of three high Arctic island plant communities in Svalbard to 15 years of experimental warming. This allowed us to analyse the relative contribution of inter- and intraspecific variability in plant community responses. Interspecific trait variation reflects species turnover while interspecific variation reflect genetic variation or plasticity.

There were either no or very small differences in species composition between warmed and control plots. Very little variation in traits was explained by treatment. Only traits related to leaf size responded (positively) to warming and that variation tends to be best described by intraspecific variation.

In conclusion, high Arctic plants appear to be extremely tolerant to climate warming.

Keywords:
Climate change, high Arctic, intraspecific variability, plant communities, plant traits, resistance to change

E21

GróLind: Assessing and monitoring vegetation and soil resources in Iceland

Höfundar: Bryndís Marteinsdóttir (flytjandi), Elín Fjóla Þórarinsdóttir, Guðmundur Halldórsson, Jóhann Helgi Stefánsson, Jóhann Þórsson, Kristín Svavarsdóttir, Magnús Þór Einarsson and Sigþrúður Jónsdóttir

Starfsstöð: The Soil Conservation Service of Iceland, Gunnarsholti, 851 Hellu

Currently, a long-term national vegetation and soil monitoring programme (GróLind) is being developed in Iceland. The programme is managed by the Soil Conservation Service of Iceland (SCSI), already funded for 10 years, and based on an agreement between the SCSI, Ministry of Industries and Innovation, the Farmers Association of Iceland and the Icelandic National Associations of Sheep Farmers. The aim of the programme is to 1) assess the conditions of vegetation and soil resources in Iceland and examine changes over time, and 2) develop indicators for sustainable land-use. The focus will be on monitoring variables linked to ecosystem functions and structure to estimate the conditions and detect any changes over time. The programme will be based on an adaptive monitoring approach, span several spatial scales and focus on land-use, vegetation and soils. Satellite images will provide large-scale data, while drones and on-site ecosystem analyses, by land users and specialists, will be used for obtaining higher resolution data. The programme will develop indicators of sustainable land-use, using experiments, available information and results from the monitoring programme. Emphasis is on collaboration with stakeholders and institutions. The data will also be used to identify areas where changes in land-use and/or revegetation efforts are needed. The overall goal is to use these ecological data to promote, in collaboration with stakeholders, sustainable land management in Iceland.

Lykilorð: Adaptive monitoring, GróLind, sustainable land management.

E22

Fyrstu framvindustig víðáttumesta birkiskógar á Íslandi?

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1Landgræðslan, 2Háskóli Íslands, 3Náttúrufræðistofnun Íslands, 4Skógræktin, 5Svarmi ehf.

Á Suðausturlandi, milli jökuls og strandar, hafa trúlega orðið einna mestu breytingar á lífríki hérlendis á síðustu áratugum. Jöklar hafa hörfað og farvegir jökuláa og landslag breyst í kjölfarið. Þessa þróun má rekja beint eða óbeint til hnattrænna loftslagsbreytinga. Á stærsta jökulsandi Íslands, Skeiðarársandi, hafa orðið mikil umskipti á sl. 30 árum. Rannsóknir á miðhluta sandsins milli Gígjukvíslar og gamla farvegs Skeiðarár sýna að þótt þar virðist vera einsleitt og flatt land hafa þróast mismunandi gróðurmynstur. Birki nam sennilega fyrst land þarna um 1990 en árið 2016 var heildarútbreiðsla þess á rannsóknasvæðinu yfir 30 km^2. Árið 2004 var útbreiðslan miklu minni og á takmarkaðra svæði, í stofninum voru eingöngu fyrstu kynslóðar plöntur, meðalhæð 10 hæstu trjánna var ríflega 60 cm og aðeins örfáar plöntur höfðu náð blómgunarþroska. Engar kímplöntur eða smáplöntur fundust árið 2004 og heldur ekki í umfangsmikilli úttekt árið 2008. Tíu árum síðar hefur þetta gjörbreyst. Hæstu tré eru orðin ríflega 3,5 m há og fræframleiðsla er gríðarlega mikil. Í fyrirlestrinum verður fjallað um þær hröðu breytingar sem orðið hafa á svæðinu. Við leiðum líkur að því að á Skeiðarársandi geti verið að vaxa upp víðáttumesti náttúrulegi birkiskógur á Íslandi ef ekki verða alvarleg áföll. Loks ræðum við hvaða lærdóm megi draga af þessum vistkerfisbreytingum fyrir endurheimt birkiskóga á Íslandi.

Lykilorð: Birki, gróðurframvinda, stofnvistfræði, vistkerfisbreyting

E23

Why is it so hard to decide what (and how) to measure? Towards a standard protocol for measuring invertebrate herbivory in tundra

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Ecological monitoring requires sustained, coordinated efforts. We need to standardize what we measure and the ways in which we measure so that data are comparable across sites and over time. Further, if monitoring is to be carried out across vast and remote areas like the circumpolar North, it is very important that protocols for data collection are simple and repeatable by different observers. However, to design such protocols, we first need a basic understanding of the ecological process we want to measure, and its spatial and temporal variability.
Leaf herbivory by invertebrates is widespread across the tundra biome. The intensity of invertebrate herbivory is likely to increase in a warmer Arctic and could be used as an indicator of ecological responses to ongoing environmental changes. Yet, there are currently no coordinated programmes monitoring this biotic interaction across the tundra biome. Recent studies suggest that there is large variation across individual plants and plant species, and between survey plots in a given site. Thus, data collection should balance the need to collect many leaves and to span across many sampling sites. Initially, repeated sampling across several localities will help assess the variation across years, and help refine the protocol for data collection. Understanding the spatial and temporal variation in the intensity of invertebrate herbivory will help design future studies and monitoring programs in tundra ecosystems.
Keywords: standardized protocols, monitoring, invertebrate herbivory

E24

Hið ósnortna Ísland - vöktun jökulskerja í Breiðamerkurjökli

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Jökulsker Breiðamerkujökuls veita ómetanlega innsýn í frumframvindu á ósnortnu landi. Kárasker og Bræðrasker komu upp úr Breiðamerkurjökli árið 1936 og 1960. Fylgst hefur verið með framvindu gróðurs í föstum reitum í skerjunum síðan 1965. Fyrstar að nema land voru æðplöntur sem einkenndu fyrstu skref framvindunnar. Upphaflega jókst tegundafjöldi æðplantna nokkuð reglulega með aldri í Bræðraskeri, þar á eftir fylgdi tímabil án mikilla breytinga í báðum skerjum er nýr landnámsfasi hófst við 40-50 ára aldur. Efnagreiningar sýna að þá var uppsöfnun næringarefna marktæk. Í Bræðraskeri sýndi tegundafjölbreytni svipaðar breytingar og tegundafjöldinn meðan í Káraskeri fór hvorutveggja lækkandi undir lok tímabilsins í þeim reitum þar sem gróðurframvindan var komin lengst. Fjölbreytugreining leiddi í ljós sambærilega gróðurframvindu í báðum skerjum. Framvindan náði nokkuð stöðugu ástandi innan 80 ára þar sem fjallavíðir (Salix arctica) hafði orðið ríkjandi en þar minnkaði tegundafjölbreytni vegna samkeppnishæfni víðisins. Framvinduferlið á jökulskerjunum líkist frumframvindunni á þeim svæðum Surtseyjar, þar sem sjófuglar hafa ekki borið næringarefni inn í vistkerfið, þrátt fyrir að þar séu lykiltegundir í frumframvindunni allt aðrar. Ennfremur er samanburður á framvindu skerjanna við gróðurfar Esjufjalla, sem hafa verið íslaus nánast allan nútíma, áhugaverður. Vöktun jökulskerja gefur möguleika á að vakta lífríki landsins við aðstæður þar sem áhrif landnýtingar mannsins eru hverfandi.

jökulsker, framvinda, vöktun

E25

Between ice and ocean; Effects of Great Skua (Stercorarius skua) and Arctic Skuas (Stercorarius parasiticus) on primary succession at retreating Breiðarmerkurjökull glacier, SE-Iceland.

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Icelandic glaciers have retreated due to climate change for over 100 years, resulting in appearance of vast abiotic proglacial areas. Primary succession in such abiotic areas is limited primarily by a lack of nutrients. Seabirds nesting in the area may play a vital role in primary succession by nutrient transfer from sea to land. Here, the effects of nutrients transferred by Great Skuas and Arctic Skuas on primary succession at Breiðarmerkursandur glacial moraine in SE-Iceland was examined. Plant diversity and density was measured, and soil organic matter at different distances from bird hummocks. Nest density was measured along six age groups of moraine deposits from 1890-1994. Preliminary results reveal that plant diversity and density, and soil nutrient levels, decrease with distance from the bird hummocks. This study will demonstrate the importance of seabird input into terrestrial ecosystems, by examining effects on local vegetation growth and rates of soil formation within moraine soils. These results enhance our understanding of the interplay between marine and terrestrial ecosystems, which are important with faster retreating glaciers and significant changes in sea bird population.

Keywords: Deglaciation, primary succession, active nutrient transfer, seabirds.

E26

Eldey - a uav-based gannet population estimate

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Unmanned aerial vehicles (UAVs) or drones represent a new frontier in environmental research. Their use has the potential to revolutionize field studies by improving data quality, provide a safer, more cost-effective and less intrusive alternative to traditional research methods. UAVs are most effective when used to examine relatively small areas close to their launch sites, whereas manned aircrafts are recommended for surveying bigger areas and to cover greater distances. The increased count precision afforded by UAVs, along with their ability to survey hard-to-reach populations and places, will most likely lead to transition from traditional methods to UAV technology in many wildlife monitoring projects. Here we present the first aerial survey of a defined seabird colony in Iceland that relied first and foremost on the use of UAV. The main task of the project was to test the feasibility of using UAV equipped with an on-board camera in a challenging environment, like seabird monitoring in Iceland most often offers. In this survey the UAV was used to estimate the biggest breeding colony of gannets (Morus bassanus) in Iceland in July 2017, on the remote island Eldey, located 15 km southwest off the coast of Reykjanes peninsula. The survey was successful and with further development of UAVs in wildlife surveys we foresee promising potentials of their use in conservation, monitoring and management projects in Iceland.

Keywords: UAVs, Drones, Remote island, Gannets, Population count.

E27

Vöktun bjargfugla á Íslandi

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Bjargfuglar er samheiti yfir nokkrar tegundir sjófugla sem eiga það sameiginlegt að verpa í björgum út við ysta sæ, yfirleitt í þéttum byggðum. Undanfarin 35 ár hefur verið fylgst mis reglubundið með stofnþróun fimm bjargfuglategunda hér á landi: fýl Fulmarus glacialis, ritu Rissa tridactyla, langvíu Uria aalge, stuttnefju Uria lomvia og álku Alca torda. Stofnar þessara tegunda eru allir stórir hér á landi í alþjóðlegu samhengi og bera Íslendingar bera því talsverða ábyrgð gagnvart þeim. Á tíma bjargfuglavöktunar hér á landi hafa orðið miklar breytingar á stofnunum, sem endurspegla að öllum líkindum breytingar og ástand vistkerfis sjávar sem fuglarnir byggja afkomu sína á. Sýnir þetta fram á mikilvægi þess að fylgst sé reglulega og til langs tíma með ástandi stofnanna, enda eru slíkar rannsóknir grundvöllur þess að greina og spá fyrir um þá þætti sem mest áhrif hafa á viðgang langlífra tegunda eins og þær sem hér um ræðir. Vöktun bjargfugla byggir að grunni til á aðferðafræði sem felur í sér staðlaðar talningar í völdum fuglabjörgum, þar sem fylgst er með fjölda fugla á varptíma. Undanfarin ár hefur vöktunin aukist talsvert að umfangi, auk þess sem aðferðafræðin hefur þróast með tilkomu nýrrar myndavélatækni. Með myndavélunum er nú t.d. mögulegt að meta varpárangur svartfugla en slíkar upplýsingar hafa ekki áður legið fyrir hér á landi.

Lykilorð: bjargfuglar, sjófuglar, vöktun, langtímarannsóknir, stofnbreytingar

E28

Explaining population dynamics in a small reindeer sub-heard in East Iceland 2002-2018

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In times of severe international Reindeer and Caribou population decline, knowing what causes fluctuations in animal numbers may be of vital importance to future preservation of the species. Because of low biodiversity in Iceland, and relative simplicity of arctic island ecology, distinguishing the causes of population fluctuations should be viable. Reindeer were introduced successfully from Finmark in Norway to East-Iceland in 1787. Except from livestock, reindeer are the only large mammalian herbivore in Iceland. With no predation, few parasites and hardly any competition for forage, there are few natural constrains to population growth other than harsh weather so far. As vegetational resistance against grazing is low under such isolated circumstances, reindeer densities have always been kept low and the distribution is restricted to East - Iceland to keep certain sheep diseases at bay. This is implemented with state-controlled hunting. The Fljótsdalsheiði sub-herd has been monitored since 1940 with annual summer population counts and hunting records. Hunting is expected to cause more than half of all mortality in most years, but the fluctuations are mainly caused by changes in recruitment rates which correlate with the North Atlantic Oscillation Index (NAO). Monitoring is ongoing.

E29
The decline of Great Skua on Breiðamerkursandur

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Iceland is an international stronghold of the Great Skua (Catharacta skua) with the densest population found in Breiðamerkursandur, a glacial outwash plain in southeast Iceland. When the last comprehensive census of the breeding population was carried out in 1984-1985 the population was estimated to be 5000 pairs, accounting 42% of the North Atlantic population. Of those 5000 pairs over 50% was found breeding in the Breiðamerkursandur area. In the summer of 2018, the nests of Great Skuas were mapped in the Breiðamerkursandur area, with only 175 nests being located. The results of our recent survey point to a marked decline in the breeding population of Great Skua over the past three decades, and we will discuss possible causes of this decline.

Keywords: Great Skua, Breiðamerkursandur, population decline, breeding.

E30

The use of the marine snail Nucella lapillus as an indicator of current organotin pollution in Iceland

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The dogwhelk (Nucella lapillus L.) is a marine snail widely distributed in the N-Atlantic, mainly found on rocky shores where it feeds on mussels and barnacles. Since the 1980s this species has been used extensively as an indicator of organotin pollution due to its wide geographical distribution and its high sensitivity to organotin compounds, especially the highly toxic tributyltin (TBT). Since the 1970s organotin compounds such as TBT and triphenyltin (TPT) were widely used as biocides in antifouling paints on ship hulls and on aquaculture gear but following the discovery of the extreme impact of these chemicals on bivalve molluscs (e.g. deformed shells) and gastropod snails (imposex; imposed male sexual organs onto females) a world-wide ban on TBT antifouling paints has been gradually imposed in the last 15-30 years. Restrictions in using such paints were implemented in 1990 in Iceland.
Dogwhelks were sampled at 15 sites in the Westfjords and SW Iceland in 2018 for analysis of imposex and ten organotin compounds. The work was carried out on behalf of the Environment Agency of Iceland as part of a monitoring program every five years since 1992. Three new sites (harbours in Njarðvík, Grindavík and Sandgerði) were added to the previous 12 monitoring sites of which Njarðvík showed surprisingly high impact in both imposex levels and chemical contents. The results and future use of dogwhelk snails as indicator species will be discussed and evaluated.

Keywords: Marine snails, imposex, pollution effects, organotins

E31

Potential dispersion of the invasive Ciona intestinalis around Iceland

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The invasive ascidian tunicate Ciona intestinalis was first observed in Iceland in 2007 in Straumsvík, SW-Iceland. This species is known to depress both species richness and species abundance at a local scale in distinct geographic areas. The species is also known as a dominant biofouling agent that has been associated to decreasing economic incomes from aquaculture operations around the world. The present study was designed to provide general information on current distribution of C. intestinalis in Iceland, through snorkel surveys in 11 harbours around the country. Ciona intestinalis was only found on the SW coast of Iceland, in all harbours from Grindavík to Akranes in dense aggregations, reaching up to 876 ind/m2. As temperature is known to influence distribution, persistence and potential spread of C. intestinalis an assessment based on long term temperature data for Iceland (1980-2015) is presented, in order to predict suitable locations for this opportunistic invader, future potential dispersion and to provide assistance for effective management decisions.

Keywords: Abundance, biofouling, distribution, harbours, tunicate

E32

Biological responses to contaminants in three-spined stickleback (Gasterosteus acueleatus) from polluted sites in Reykjavik.

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In ecotoxicology, pollution monitoring through chemical analysis in sediment, water and biota touches only partly the problem concerning pollutant interactions in biota and ecosystems. While important, such standalone information does not provide the necessary basis to demonstrate effects of pollution on the biota, hence the study of biological effect of contaminants is complementary in that respect. Biological responses, i.e. biomarkers, have been implemented in wide range of animal species on different biological levels to provide an understanding in response mechanisms to contaminants as well as effects caused by them. In this project we present the implementation of EROD enzyme activity measurements, a biomarker of exposure focused on detoxification mechanism of planar compounds in animals, combined with the use of hepatosomatic index to investigate stress and stress induced effects of contaminants in three-spined sticklebacks (Gasterosteus aculeatus) from polluted sites in Reykjavík. Fish were collected in summer 2018. The analysis showed severe and moderate elevation in enzyme activity and hepatosomatic index respectively, from all 3 sites in Reykjavíkurtjörn in comparison to fish from reference sites, indicating impact of bioavailable contaminants on biota in Reykjavíkurtjörn.

Keywords: Gasterosteus acuelatus; EROD; hepatosomatic index; Reykjavíkurtjörn

E33

Sea lice in Icelandic coastal waters

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There are two known species of so-called sea lice in Icelandic coastal waters, the infamous host specialist salmon louse (Lepeophtheirus salmonis) and the not so host selective species Caligus elongatus. Research on L. salmonis has been extensive in countries that are major producers of salmonids in sea cages, mostly Atlantic salmon (Salmo salar) such as Norway, Faroe Islands, Scotland and Canada. Chile also produces S. salar in sea cages but research there has focused on Caligus rogercresseyi as that is the species of most concern and L. salmonis has not been of concern. C. rogercresseyi is closely related to C. elongatus found in Icelandic waters and recent documentation from sea cages in Iceland as well as Norway have given reason for more focus on the species which has stood in the shadow of L. salmonis and has been considered of little concern for aquaculture as well as wild stocks.

Knowledge of these species distribution and compositions around Iceland is poor and have been given little focus. Fish farming companies are off course focusing on not losing their investment and so far, most documentation on sea lice are to be found from these companies. Documentation is therefore in almost every case, only from within sea cages on farmed fish.

Lykilorð: Lepeophtheirus slamonis, Caligus elongatus, salmonids, aquaculture

E34

Microbe in Icelandic Marine Environments

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Iceland ranks 19th among the world's leading fishing countries and the icelandic fishing industry is second in export revenue generation for the country's economy. Valuable fish species like cod or haddock depend on a healthy marine food web, which in turn relies on marine microbes. These microbes organise themselves in interactive communities that control the flow of energy and nutrients which are essential to the oceans health. But little is known about microbes in Icelandic waters. Here, we propose to establish the baseline knowledge of marine microbes in the ocean around Iceland. To do so, we investigated the structure and function of marine microbial communities using high throughput sequencing of DNA (metagenomics). Deciphering the functions of these microbial communities will help us better understand their community dynamics and their potential impacts on the higher levels of the food web.

Keywords
metagenomics, ocean, microbes, climate change, food web.

E35

Killer whale associations with herring and mackerel in Iceland

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In the North Atlantic, killer whale occurrence is generally related with the spatial distribution of lipid rich fish species. In Norway and Iceland, killer whales appear to specialise on herring although this dietary preference may be seasonal. Indeed, in the Norwegian Sea, killer whales associated with mackerel but not herring in the summer. In Icelandic waters, mackerel has been increasingly observed in the summer and currently greatly surpasses the estimated stock size of the Icelandic summer-spawning (ISS) herring, which has been declining. Whether herringspecialist killer whales switch from a preferred herring prey to mackerel in this context remains to be tested. To investigate this, we conducted marine mammal observations onboard the International Ecosystem Summer Survey in the Nordic Seas taking place in Icelandic waters in 2015 and 2017. Simultaneously, we monitored killer whale occurrence in an inshore herring spawning ground, Vestmannaeyjar. Killer whale encounters in offshore regions were sparse and did not suggest strong associations with mackerel. In contrast, killer whales occurred regularly in a herring spawning ground. These results suggest preferential feeding on herring, despite decreasing prey availability and increasing availability of an alternative resource. Future work will be required to assess the levels at which prey limitation might occur and how prey choice might be affected by changing availability and predictability of prey.

Keywords (max. 5 words): killer whale, mackerel, herring, diet specialization

E36

Linking foraging ecology and population declines in Atlantic puffins

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Atlantic puffins Fratercula arctica are a common and key species of Atlantic seabirds, but their small size and sensitivity has so far prevented tracking their foraging movements, resulting in a poor knowledge of their foraging ecology. Puffins have been declining dramatically in the last few decades and are now endangered in Europe. Reasons for the declines are not fully understood, but are likely linked with resource availability during breeding. We combine state-of-the-art tracking technology with field observations and novel DNA metabarcoding techniques to conduct a comprehensive study of puffins' foraging ecology. We conduct the study across multiple populations with different breeding success and population trends, including two key declining populations (Norway and southern Iceland) and two relatively healthy populations (Wales and northern Iceland). New micro-GPS loggers (<4g) track for the first time the foraging movements of breeding puffins, and we use an ethoinformatics approach to estimate behaviour and energy expenditure from the spatial data. Automated cameras deployed at the nest record chick-provisioning patterns and chick diet, and DNA analyses of faeces samples reveal adult diet. Our study reveals the foraging patterns of the species and compares foraging strategies and diet between populations, with the ultimate aim to identify the drivers of poor breeding success and population declines.

Atlantic Puffin, Foraging Ecology, GPS, DNA metabarcoding

E37

Soundscape dynamics at breeding sites of the Atlantic puffin (Fratercula arctica) in northeast Iceland

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Abstract: Environmental ambient noise, also called the soundscape, plays an important role in animal behavior and ecological processes. Disruptions to natural soundscapes by anthropogenic noise may influence an animal's biology and the ecological process of that environment. Therefore, it is important to first describe and quantify soundscape dynamics within an animal's acoustic space to better understand and assess potential negative impacts of anthropogenic noise. The objective of this research is to quantify and describe terrestrial soundscapes around rookeries of the Atlantic puffin (Fratercula arctica), which have seen significant population declines in recent years. Four passive acoustic recorders (SM4 from Wildlife Acoustics) were deployed to collect recordings every four minutes within and around puffin burrows in northeast Iceland from June to September, 2018. Vocalizations and other biological sounds were identified and described, while temporal and spectral trends in sound intensity and spectral composition were quantified across multiple timescales. Preliminary results indicate environmental sound intensities ranged between 47 and 85 dB SPL re: 20 µPa rms, were frequency dependent, and likely influenced by tidal patterns and weather conditions. Lowest daily intensities tended to occur between 0100 and 0300 hours while daily maximums occurred between 1400 and 1600 hours.

Keywords: soundscapes, puffins, seabirds

E38

Hearing of the Atlantic puffin, Fratercula arctica and a common murre, Uria aalge measured in Northeast Iceland

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Puffins are declining worldwide and both climate change (in terms of prey shifting habitat) or noise (with underwater noise in terms of ship traffic is increasing around the world) can have an impact on their survival. Therefore, it is important as a first step to know what the animals can hear in order to study the possible impact of noise. The aim of the studies was to investigate the hearing of two seabird species. the Atlantic puffin, Fratercula arctica and a common murre, Uria aalge. The puffin was caught on June 2, 2017 using a mesh net strung across multiple burrows at a rookery on Tjörnes in northern Iceland. The murre was obtained June 3, 2017 using a noose pole at a rookery on Langanes peninsula, northeastern Iceland. Hearing tests were conducted in a portable semi-anechoic chamber using physiological, auditory evoked potential (AEP) methods. Hearing data from the puffin were quite clear and provided an auditory curve that was not unlike AEP hearing thresholds in other birds. Lowest measured thresholds were found at 1-2 kHz and responses were measurable from 0.5 to 6 kHz. The murre responses were substantially elevated compared to the puffin and the frequency range was narrower from 1-4 kHz. In conclusion, the hearing of two bird species in the wild was for the first time successfully measured and data from more bird species will continue in the near future.

Keywords: Hearing, ABR-method, puffin, common murre

E39

Northern bottlenose whales in a pristine environment respond strongly to close and distant navy sonar signals

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Beaked whales are the second largest family of cetaceans, however remain poorly understood. Underwater noise, particularly impulsive noise transmitted by high-power sources such as naval sonars and seismic airguns, is considered to be one of the main threats to the northern bottlenose whale; the most common beaked whale in Icelandic waters. To investigate the roles of source distance and received sound level in an acoustically pristine environment, we conducted controlled exposure experiments (n=3) with 12 northern bottlenose whales near Jan Mayen, Norway. Animals were tagged with high-resolution archival tags (n=1 per experiment) or medium-resolution satellite tags (n=9 in total) and subsequently exposed to sonar. We also deployed bottom-moored recorders to acoustically monitor for whales in the exposed area. Tagged whales initiated avoidance of the sound source over a wide range of distances (0.8-28 km), with responses characteristic of beaked whales. Both onset and intensity of response were better predicted by received sound level than by source distance. In this pristine underwater acoustic environment we found no indication that the source distance modulated the behavioural effects of sonar, as has been suggested for naval training ranges where animals are frequently exposed to sonar.

Keywords: Behaviour, Marine nammals, Effects of noise, Migration, Human disturbance

E40

Comparison of the call repertoires of killer whales (Orcinus orca) between locations within Iceland and between Iceland and Norway

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Killer whale (Orcinus orca) call repertoires provide information on the relatedness of groups and populations. Killer whales in Iceland and Norway are presumed to belong to the same ecotype, specialising on herring as prey. They are highly associated to herring abundance and movement patterns but recent studies indicate that different movement patterns between herring overwintering and spawning grounds exist in Iceland and that some Icelandic whales also exploit higher trophic level prey. The Icelandic and Norwegian populations are thought to have been in contact prior to the collapse of the Atlanto-Scandian herring stock in the 1960s. This study provides the first detailed description of the call repertoire of killer whales in Iceland and updates existing catalogues of the Norwegian population. 42 call types and 30 subtypes are described in Iceland and 32 call types and 21 subtypes in Norway. In Iceland most call types occurred in both, herring overwintering and spawning grounds but some call types were only recorded in one of the two locations, supporting that not all killer whales in Iceland exploit herring year-round. No matches were found between Iceland and Norway, indicating that these two populations may never have been completely mixed. These results suggest that the differences in call repertoires reflect the complex movement patterns of this killer whale ecotype, with high mobility between locations in Iceland but little or no movement between Iceland and Norway. Killer whale, Orcinus orca, acoustic behavior

VEGGSPJÖLD / POSTERS

P1

Discovery and distribution of *Mediopyxis helysia* in Breiðafjörður, West Iceland

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A survey on phytoplankton abundance and community composition in consortia with physical and chemical drivers was initiated in Breiðafjörður, West Iceland, in May 2007. Phytoplankton abundance and species composition were estimated at 10 sampling sites in the fjord throughout the year, on a 10 day interval during spring and summer but less frequently during autumn and winter. Samples for phytoplankton species identification and enumeration were collected at 1 and 10 meter depth. The phytoplankton community composition was frequently dominated by diatoms, with sporadic blooms of other algae, for example Phaeocystis pochetii and Emiliania huxleii.
In 2007 a new species of diatoms to Icelandic waters, Mediopyxis helysia, was detected in the phytoplankton community of Breiðafjörður. Since its discovery, M. helysia was has been detected sporadically at all sample locations, with highest abundance observed at the northernmost and shallowest sample locations in the fjord. M. helysia was frequently detected in autumn and winter (September through January) with erratic occurrence from June to August. Comparison of M. helysia abundance with measured environmental parameters, i.e. temperature, salinity, nutrient availability, revealed no significant correlation. The dispersal mechanism of M. helysia is unknown, but the locations of possible origin are Scotland, The German Bight, Gulf of Maine and Bay of Fundy. M. helysia is a large and obvious species which is hard to overlook and thus it might be indicative of possibly more extensive transport of inconspicuous phytoplankton or other marine microscopic organisms from unknown sources.
The discovery of M. helysia in the Breiðafjörður survey highlights the value of continuous, year round, observations of phytoplankton community composition in order to fathom species diversity, and evolution of ecosystems.

P2

Arctic tern chick mortality in Iceland: influence of dietary composition and provisioning rates

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Many seabirds populations across the North Atlantic have been subjected to declines and breeding failures often due to local or large scale reductions in food availability during breeding. Arctic Terns Sterna paradisaea in W Iceland experienced very low breeding success in 2008-2011, primarily driven by low chick fledging success as a consequence of low growth rates and starvation. In order to explore the factors contributing to these poor conditions for chick growth and survival, we quantify the types and size composition of prey delivered to chicks in colonies across the Snaefellsnes peninsula in W Iceland, and relate between-colony variation in prey delivery rates to chick growth and survival. However, as sandeels are only present in the waters of S and W Iceland, we also quantify prey composition, delivery rates, chick growth rates and survival in colonies in NE Iceland, in order to compare success rates in areas with differing prey communities and where anecdotal evidence suggested higher success rates. Prey composition and size varied greatly between the two regions and colonies. In W Iceland, higher delivery rates were associated with greater fledging success, but sandeels were delivered at low rates at all colonies. In NE Iceland, capelin replaced sandeels as the main marine prey, but delivery rates of capelin were either very low or inconsistent, and fledging success in NE Iceland was similarly low, in contrast to expectations. Constraints on the availability of food resources for chicks therefore seem to be driving the recent very low breeding success both in W and NE Iceland, and understanding the causes of changing food availability will be key to reversing these trends.

Keywords: Marine environment, Seabird, Sandeel, Arctic Tern.

P3

Microplastics in blue mussels (Mytilus edulis) from coastal sites in Iceland.

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Due to raising concerns worldwide on the issue of marine plastic pollution the Environment Agency of Iceland has requested for analysis of plastic particle abundance at coastal sites around Iceland. In summer and autumn 2018 the University of Iceland´s Research Centre in Sudurnes carried out sampling and analysis of microplastics (<5mm) in blue mussels (Mytilus edulis) from eight coastal sites in Southwest and West Iceland. Microplastics were analysed in soft tissues of mussels according to the methodology applied and suggested by NIVA in Norway for blue mussels (rapport 7209-2017). The study revealed that 40-55% of mussels from intertidal zones contained microplastics which were mostly fibers. Contaminated mussels contained on average 1.27 particles/g ww soft tissue ranging from 0,08 – 3,8 mm in size.

Keywords: Microplastics; Mytilus edulis; Intertidal zone monitoring

P4

The effects of rearing environment on the growth and metabolic rate of lumpfish (Cyclopterus lumpus)

Student: Amber Monroe
Adviser: Helgi Thorarensen
Facilities: Verið Science Park

Lumpfish (Cyclopterus lumpus) is of economic value for its caviar and versatility as a biological control in fish farms. Research in recent years shows that using lumpfish as an alternative to chemical treatments is proving effective in controlling sea lice (Lepeophtheirus salmonis, Caligus elongatus) in farmed Atlantic salmon (Salmo salar) populations. However, there is still much to be learned about this species and its physiological requirements, particularly on fish farms. The objective of this study is to examine the effects of carbon dioxide (CO2) and ammonia (NH3) on the growth and metabolic rate of juvenile lumpfish. The study will be divided into two 3-month segments, with the first focusing on the effects of NH3 within various pH parameters. The second will examine the interactions and effects of both NH3 and CO2, also within multiple pH parameters. The varying pH will shift the proportion of NH3 and NH4+(ammonium) in the experimental tanks. Future results will lay the groundwork for other lumpfish physiology studies and lead to better understanding of their health and purposes within aquaculture systems.

Key Words: Lumpfish, Carbon Dioxide, Ammonia, Metabolic Rate, Water Quality

P5

Colonization of downy birch in early succession

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Downy birch (Betula pubescens) is the dominant species in long lived and stable forests and woodlands in Iceland but it can also colonize early-successional sites. A recent example of the latter is the sudden establishment and rapid expansion of birch on Skeiðarársandur outwash plain. This must be due to long distance dispersal as the nearest seed source is >10 km away. Birch is believed to have colonized initially in one or a few major events, when the many sequential conditions necessary for successful dispersal and establishment must all have been favourable. This includes a large seed crop of high quality, conditions for dispersal at the right time of year, safe sites for germination and establishment and favourable conditions for survival and growth. Here, we report on selected life history stages that are likely to be limiting for the birch population on Skeiðarársandur, namely seed quality and seedling and sapling establishment and their relationship with environmental factors. Seed quality in the birch population on Skeiðarársandur has been extremely poor with germination rates varying from <2% to a maximum of 22% in 2017. A survey in 2018 revealed very high variation in seedling and sapling density in two areas where birch had already established. Sapling density in one area was 0.05 plants m^{-2} but in the other it was 9.4 plants m^{-2}, mostly plants with <4 leaves.

Lykilorð: Downy birch, Betula pubescens, early succession, seed quality, birch density

P6

Growth and age of Downy Birch on Skeiðarársandur:
Age and size distribution and growth patterns of a colonising population of downy birch on a early successional outwash plain

Höfundar: Hulda Margrét Birkisdóttir, mastersnemi við Háskóla Íslands, Guðrún Óskarsdóttir, doktorsnemi við Háskóla Íslands, Ólafur Eggertsson, Skógræktin, Þóra Ellen Þórhallsdóttir Háskóli Íslands og Kristín Svavarsdóttir Landgræðslan

In recent decades, downy birch (Betula pubescens) has colonized the sparsely vegetated outwash plain of Skeiðarársandur. Selected aspects of the birch population have been monitored since 2004 but an in-depth study of its dynamics was initiated in 2017. The research reported here focuses on the population biology. It encompasses 4 study sites but here we present preliminary results from one site (A4) in the central part of the plain. This was probably the second area that the birch colonised. In the summer of 2018, all birch trees were counted on belt transects (750 m²). Annual growth was measured as length increments on dominant shoots. For tree age, tree rings were counted in 72 randomly selected and harvested trees (>20 cm in length). Recruitment is highly spatially variable across the four study sites with seedling and sapling density by far the highest in the area presented here (A4). The size distribution was highly right skewed and the age distribution left skewed (plants >20 cm). The oldest harvested tree was 21 yrs old but >90% of the population were younger than 5 yrs. The tallest tree in the sample (N= 7074 plants) was 263 cm long but only 1% of the trees were >20 cm long. The mean annual shoot increment was 13.1 cm in 2016, 10.0 cm in 2017 and 9.3 cm in 2018. This appears to be high compared to earlier estimates of birch growth rates in Iceland. For all three years, the mean annual growth increment was greater in larger trees (>100 cm long) than in plants <100 cm.

Birch, annual shoot increment, age distribution, size distribution, Skeiðarársandur

P7

A new method in locating Arctic charr spawning grounds using a combination of diving and genotyping

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Arctic charr has been present in lake Thingvallavatn since the lake's formation after the last ice age around 10,000 years ago. Since then this species has diverged into four distinct morphs that differ from each other in morphology, life history, and feeding habits. Arctic charr is important as an evolutionary model for scientific research and is one of the few native fish species of Iceland. Around October each year three morphs of Arctic charr (i.e. planktivorous charr, small benthic charr, piscivorous charr) spawn in Svínanes, one of the known spawning areas in lake Thingvallavatn, but it is unknown to what extent they spatially overlap on the spawning grounds. Gill net surveys during September and October have shown in what areas mature Arctic charr can be found, but the precise location of the redds (Arctic charr nests) of each morph is still unknown. An exploratory dive was conducted during the spawning season and Arctic charr eggs were discovered over a much smaller area than first observed during the gill net surveys. During a second dive in December, Arctic charr embryos were collected at different areas of the spawning grounds. We are currently developing a genotyping platform using KASP assay which will be used to determine where exactly each one of the three morphs spawns. Once established, this genotyping platform will have potential for broader applications, for example in determining whether aquaculture fish escapees are interbreeding with natural populations.

Key words: Genotyping – Arctic charr – Spawning grounds – Diving

P8

Origin of the common eider, Somateria mollissima in the Faroe Islands and Iceland

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The common Eider, Somateria mollissima, is a large Holarctic sea duck, composed of six subspecies. The sub-species statuses are formed on the basis of morphological data. The eiders in the Faroe Islands and Iceland have been assigned to the subspecies S. m. faeroeensis and S. m. borealis, respectively. The aim of this study is to examine the phylogeographic origin of the Faroese and Icelandic common eider populations with comparisons to other eider subspecies. Genetic and morphological data was obtained in the Faroe Islands and Iceland during the summer of 2017. Feathers from breeding females were collected for DNA extraction, while standardized measurements were taken of the same birds. Additionally, previously analyzed specimens from several different studies were obtained for other eider subspecies. Sequence analysis of four nuclear and mtDNA markers, show that there is genetic difference between the six eider subspecies. The eiders in the FaroeIslands comprise a distinct population with closest similarity to eiders from western Iceland and the Shetlands, where as the population in northern Iceland appears divided between the nominate subspecies S. m. mollissima and the S. m. borealis subspecies. From tracking data, the Svalbard eiders (S. m. borealis) are known to migrate both to north-east Iceland and north Norway. This might explain the similarities between eiders from north Iceland and Grindöya, N-Norway, which belong to the nominate subspecies S. m. mollissima.

Keywords: Subspecies, phylogeography, population genetics, morphology, DNA

P9

Hlutverk gulvíðis og loðvíðis í frumframvindu gróðurvistkerfa

Vigdís Freyja Helmutsdóttir, meistaranemi í líffræði við Háskóla Íslands, 2019.
Leiðbeinendur:
Þóra Ellen Þórhallsdóttir og Kristín Svavarsdóttir.

Íslenska flóran er tiltölulega fátæk af trjám og runnum. Fjórir runnar teljast til víðiættkvíslarinnar og eru stórvöxnu tegundirnar tvær, gulvíðir (Salix phylicifolia) og loðvíðir (S. lanata), taldar lykilplöntur í íslenskum vistkerfum. Til dæmis hafa þær áhrif á nærloftslag með skjólmyndun og snjósöfnun, auk þess sem lauffall og sambýli við jarðvegsörverur, m.a. svepprótarsveppi, stuðlar að frjóum jarðvegi. Víða um land hefur mátt greina aukna útbreiðslu víðis undanfarin ár. Það hefur verið tengt við breytta landnýtingu, einkum minnkandi sauðfjárbeit, en einnig hlýnandi loftslag. Markmið þessa verkefnis verður að skoða hlutverk gulvíðis og loðvíðis í þróun vistkerfa snemma í frumframvindu. Til þess er Skeiðarársandur kjörið rannsóknarsvæði og mun verkefnið bæta við þær rannsóknir sem þar eru í gangi á landnámi birkis (Betula pubescens). Sú tilgáta að víðir skapi hagstæð skilyrði fyrir birki, mögulega gegnum svepprótartengsl, verður einnig prófuð. Metin verður fylgni útbreiðslu, þekju og stærðar tegundanna við umhverfisþætti, eins og landhæð, halla og átt, grófleika undirlags, auk þekju mosa og æðplantna, þ.m.t. birkis. Á loftmyndum teknum í hárri upplausn af Skeiðarársandi sumarið 2016, er hægt að greina og kortleggja víðitegundirnar tvær. Afgirt girðingarhólf má svo nota til að meta áhrif beitarfriðunar. Niðurstöðurnar munu m.a. nýtast við beitarstjórnun og skipulagningu landgræðsluaðgerða, sérstaklega þar sem áhersla á notkun innlendra uppgræðslutegunda er að aukast.

Lykilorð:
Víðir, birki, gróðurframvinda, Skeiðarársandur.

P10

Invasive European flounder (Platichthys flesus) in Icelandic waters

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The invasive European flounder (Platichthys flesus), a flatfish species native to central European coasts, has been documented in Icelandic waters since 1999. The population rapidly increased in the new environment and has now spread around the whole country. Previous studies on the ecological impact of the flounder on native species have highlighted potential interspecific competition as well as direct predation on native salmonids as well as the European plaice (Pleuronectes platessa).
A Ph.D project has been proposed to further increase the knowledge of the colonization of the flounder in Iceland. Within this project, it is planned to examine the origin and introduction pathways of the flounder using genetic analysis as well as to map the niche use of the flounder and niche overlap with native species and to test whether this changes along the invasion front. Furthermore, part of the project will be to assess the potential of using recreational fishing of flounder as a management.

P11

Joining forces in ecology and business through creating educational materials

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Ecosystem degradation poses a serious threat to our livelihood and economies, as identified by the UN Sustainable Development Goals (SDGs). There is increasing recognition that these issues cannot be solved in isolation and different stakeholders and specialists need to work together. Effectively reversing ecosystem degradation and restoring landscapes requires professionals who can bridge the gaps between ecology and economy, but such training is lacking. The European Network for the Advancement of Business and Landscapes Education (ENABLE) was established to raise awareness about the benefits of integrated landscape management based on sustainable business models through the creation of an educational platform involving academics, private businesses, public sectors and NGOs.

One of the outputs of ENABLE is an eight-week Massive Open Online Course (MOOC). The MOOC "Business Model Innovation for Sustainable Landscape Restoration" is the second in a series on business approaches to sustainable landscape restoration. It aims to raise awareness about landscape degradation, and how business-driven landscape restoration initiatives can be a part of the solution. In the MOOC, participants work in groups through the business model innovation process. Each step is illustrated with three real cases of landscape restoration: a large-scale woodland restoration in Iceland; the diversification of cropping systems in Spain; and the challenges of recovering from forest fires in Portugal.

P12

Herbivory Network – coordinating studies of herbivory in the North

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The Herbivory Network (http://herbivory.lbhi.is) is an international research network that brings together scientists from Arctic and alpine regions to investigate the role of herbivores in these changing ecosystems. Plant-herbivore interactions are central to the functioning of tundra ecosystems, through their effects on biodiversity, energy flows and nutrient cycling, and can influence their resilience to ongoing environmental changes. However, the outcomes of plant-herbivore interactions vary over space and time, leading to different impacts of herbivory at different sites and times. The causes of this are presumably related to ecosystem-specific conditions, such as human management, variations in geological substrate or productivity among others. To accurately forecast the future of tundra ecosystems under changing environmental conditions, we need to understand the drivers of the spatial and temporal variation that influence the outcomes of plant-herbivore interactions. Effectively addressing these questions at a global scale requires coordinated research efforts. The Herbivory Network covers this gap, by fostering collaborations and facilitating multi-site comparisons through the development and use of common experimental protocols.

P13

Farming for Conservation: How the eiderdown industry in Iceland benefits breeding Arctic terns (Sterna paradiseae)

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Human activities can have both negative and positive impacts on bird populations. However, some potential positive effects have been previously overlooked in scientific research. One of the main benefits humans have provided for birds is protection through mitigation measures and managed areas. Iceland is home to one of the largest and most lucrative eiderdown industries in the world. Eiderdown farmers use several management practices including anti-predator techniques to protect their eider colonies. These measures may also indirectly benefit other species of birds such as Arctic terns (Sterna paradiseae), which are commonly found nesting in association with eiders (Somateria sp.). By measuring Arctic tern reproductive success, adult body condition, and resource allocation in colonies found within and outside eider farms, we hope to describe the impacts these management practices have on Arctic terns and if this associative breeding is beneficial to either or even both bird species. This study is important as Arctic tern populations have declined globally and in Iceland. This project will also fill significant knowledge gaps in the breeding biology of Arctic terns in Iceland where no long-term monitoring or large-scale conservation program for the species exists. The results of this study will be of use and interest for both persons and institutions concerned with seabird conservation, but also for eider farmers that rely on eiderdown farming.

Key words: Seabirds, Eiderdown Farming, Conservation, Resource Management, Sustainability.

P14

Nitrate: an Environmental Endocrine Disruptor? A review of evidence and research needs

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This poster presents a review of the increasing experimental evidence that inorganic nitrate acts as an environmental endocrine disruptor. The double Nobel Prize awarded Haber-Bosch process, which fixates atmospheric nitrogen to ammonia as a feedstock for agricultural nitrate-fertilizers, kick-started the Agricultural Revolution. Subsequently, environmental nitrogen emissions have increased tremendously. This has also lead to an increase in the nitrogen concentrations in surface waters. Even though nitrogen levels during preindustrial times cannot be precisely estimated, it is indisputable that present day levels (typically ranging 1−30 mg/L NO_3−N in surface waters) are likely above the concentrations where most aquatic life evolved. During the past decades, deviations in wildlife reproductive hormone levels and sex ratios have been reported in organisms ranging from alligators, fish and frogs to small crustaceans. Despite much research effort, no single major cause of the observed changes has been found. This poster presents a compilation of the growing experimental evidence for environmental endocrine disruption by inorganic nitrate. We reviewed 26 environmental toxicology studies in order to report and assess studies, where endocrine effects of nitrate and its metabolites have been investigated on aquatic organisms and ecosystems. Following the framework of Adverse Outcome Pathways (AOP) we furthermore investigated possible molecular initiating events and key cellular events, which may link nitrate and its metabolites to endocrine disrupting outcomes. Our main finding is that nitrate has endocrine disrupting properties and hypotheses for mechanisms exist, which warrants further investigations.

Keywords: aquatic ecotoxicology, environmental endocrine disrupters, nitrate, adverse outcome pathways

P15

The effects of birch colonization on soil organic matter decomposition.

Jóhannes Bjarki Urbancic Tómasson, Kristín Svavarsdóttir, Þóra Ellen Þórhallsdóttir, Kristinn Pétur Magnússon.

Recently a self-sown birch (Betula pubescens) forest has begun to colonize the vast glacial floodplain Skeiðarársandur in Sout-East Iceland. A large part of the sand has been colonized but areas within the sand have different densities of developing birch.
Here the effects of birch colonization on soil organic matter (SOM) decomposition was estimated using the tea bag index (TBI), which simulates decomposing leaf litter with buried tea bags. In the TBI, green and red tea are used to estimate two environmental factos, the stabilization factor (S) and the rate of decomposition (k), respectively. The experiment was conducted at three different birch densities and within each site „trees“ were split into four size classes: large, medium, small and no trees. A positive control are was set up in Bæjarstaðarskógur, birch woodland.
Differences in S between sites was irrelevant. The rate of decomposition, k, varied between sites according to birch density, with the highest and lowest densities having the highest and lowest k, respectively. Within sites large trees have the highest k but both medium and small trees have a lower k than the „no-trees“ treatment. Using simple statistical tests, differences could only be found involving the positive control group.
The results indicate that birch accelerates SOM decomposition as birch density increases. Furthermore, compared to patches with no trees, decomposition is slowed near small and medium sized trees and accelerated near large trees.

Tea bag index
Soil organic matter
Litter decomposition
Primary succession
Mycorrhizal fungi

P16

Reindeer winter forage – Long term monitoring research

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Reindeer (Rangifer tarandus) are a key species in the Arctic, environmentally, culturally and economically, and play a vital role in arctic food chains. The species is under threat of fragmentation and degradation of its habitat due to human development and climate change. Access to winter forage, mainly lichens in arctic heathlands, is considered one major factor determining growth of the species' populations. Thus, knowledge of winter forage pastures is important to ensure adaptive management of reindeer populations.

The ongoing project aims to establish long term monitoring sites and record changes in known winter forage areas of reindeer in Iceland, using comparable methodology to Norwegian studies that have been carried out for decades by NINA (Norwegian Institute for Nature Research). The study aims to identify possible effects of reindeer on winter forage areas and hopefully vice versa. The sites, revisited every five or ten years, include areas which are accessible to reindeer and areas fenced out to study the effects of grazing. Icelandic reindeer seem to thrive in areas where lichens are sparse. We hope the project helps to identify other important sources of winter forage species than lichens.

Keywords: Reindeer, winter forage, lichens, monitoring

P17

Extensive genetic divergence between recently evolved sympatric Arctic charr morphs

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The role of genetics, environment and history in ecologically driven divergence and adaptation, can be studied on adaptive radiations or populations showing ecological polymorphism. Salmonids, especially the Salvelinus genus that includes Arctic charr (Salvelinus alpinus), are renowned for both phenotypic diversity and polymorphism. Arctic charr exhibits many instances of sympatric polymorphism. Particularly well studied are the four morphs in Lake .ingvallavatn in Iceland. To investigate relatedness and genomic differentiation between morphs we extracted variants from developmental transcriptome data from three of those morphs, and verified 22 variants in population samples. The data reveal genetic differences between the morphs, with the two benthic morphs being more similar and the PL-charr more genetically different. The markers with high differentiation map to all linkage groups, suggesting ancient and pervasive genetic separation of these three morphs. No marker associated fully with morph, suggesting polygenic basis of traits separating them. Furthermore, gene ontology analyses suggest differences in collagen metabolism, odontogenesis and sensory systems between PL-charr and the benthic morphs. Genotyping in population samples from all four morphs confirms the genetic separation. The genetic separation of the other three morphs is consistent with certain degree of reproductive isolation.

P18

Food selection of waders on migration at Reykjanesskagi

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High arctic wader populations stopover in Iceland on their way from wintering grounds in Europe and Africa to the high Arctic in Greenland and Canada. These populations seek sandy and muddy beaches and rocky shores on the southwest and west part of Iceland. Little is known about their diet in this sub-arctic stopover site and whether they specialize in the same type of diet as they do on their wintering grounds. This research focused on gathering information and sampling individual birds by means of stomach flushing and stable isotope analysis, as well as stomach content analysis using dead birds to determine the most important food sources and if the species show feeding specialization on their northward migration. Apart from the red knot all wader species studied seemed to be generalized. Sanderlings were generalists feeding on diet items mostly from the wrack beds such as seaweed flies and their larvae and polychaeta from the sandy beaches. Turnstones ate a wide variety of food items, but these items were mostly from the wrack beds and the rocky shore such as seaweed fly larvae, amphipods, littorinids and barnacle. Ringed plovers mostly ate polychaeta, seaweed flies and larvae but they did have the biggest range in stable isotopes and ate the most diverse food sources, probably due to their feeding strategy. Red knots were very specialized and ate almost exclusively Littorina sp. apart from a few seaweed flies. The few dunlins that were caught contained oligochaetes, dipterans and amphipods. Very few diet studies have been performed in Iceland on waders apart from results on few collected individuals. That data and the results of this thesis are shown and compared with relevant information about wintering diets of waders.

Waders, diet, stop-over, migration, stable isotopes.