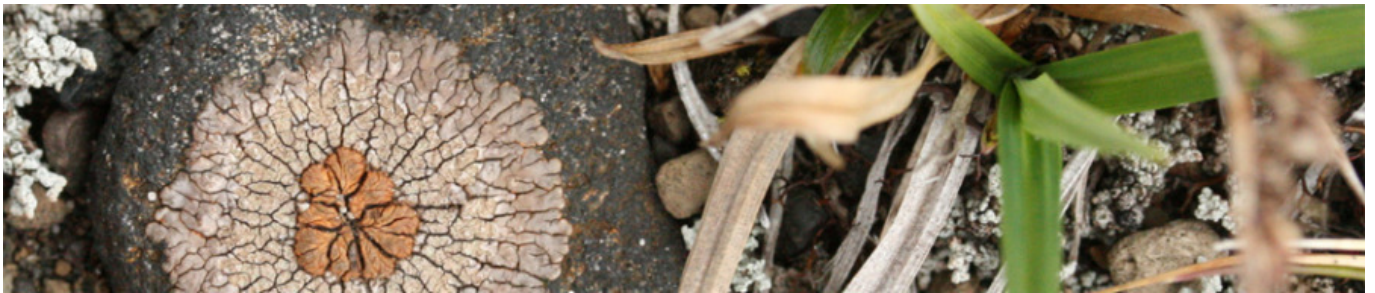


ÁGRIP ERINDA OG VEGGSPJALDA

VISTÍS / ECOICE

NORRÆNA HÚSINU 2. APRÍL 2014



VISTFRÆÐIFÉLAG ÍSLANDS

VISTFRÆÐIFÉLAG ÍSLANDS
VistÍs 2014 / EcoIce 2014
Ágrip erinda og veggspjalda

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STJÓRN VISTFRÆÐIFÉLAGS ÍSLANDS

Ingibjörg Svala Jónsdóttir, formaður
Gísli Már Gíslason, gjaldkeri
Erla Björk Örnólfsdóttir, ritari
Erpur Snær Hansen, meðstjórnandi
Tómas Grétar Gunnarsson, meðstjórnandi
Ágústa Helgadóttir, meðstjórnandi
Jóhann Þórsson, varamaður

UNDIRBÚNINGSNEFND

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Gísli Már Gíslason
Ana J.Russi Colmenares

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ÁVARP / INTRODUCTION

Kæru vistfræðingar,

Ég vil bjóða ykkur öll hjartanalega velkomin til þessarar ráðstefnu sem er sú þriðja sem Vistfræðifélagið stendur fyrir. Vegna smæðar samfélags okkar er starfsumhverfi vistfræðinga hér á landi að mörgu leyti frábrugðið starfsumhverfi vistfræðinga erlendis. Það er oft talað um nauðsyn “kítísks massa” til að skapa vísindalega frjótt umhverfi; nokkuð sem nágrannalönd okkar og vísindastofnanir þeirra hafa lagt áherslu á. Þar er ekki óalgengt að heilu háskólastofnanirnar, háskóladeildir og aðrar sérhæfðari rannsóknastofnanir sinni vistfræðilegum rannsóknum með aðkomu tuga vísindamanna og fjölda nemenda.

Hér á Íslandi erum við hins vegar fá og dreifð á margar stofnanir. Mörg okkar leitast því við að skapa þennan kítíska massa í gegnum öflug alþjóðleg tengsl og rannsóknarsamvinnu, sem er mjög jákvætt og stuðlar að gæðum í rannsóknastarfinu. Hins vegar væri einnig æskilegt að geta skapað kítíska massa hér innanlands. Og hvernig gerum við það? Jú með því að efla tengsl einnig milli íslenskra vistfræðinga.

Þetta er einmitt eitt af megin markmiðum Vistfræðifélags Íslands. Félagið okkar spratt upp af þörf til að skapa innlendan vettvang fyrir vistfræðinga til að hittast og skiptast á skoðunum og skapa tengsl. Árleg ráðstefna félagsins er meginþunginn í þeirri viðleitni þar sem formleg erindi og veggspjaldakynningar blandast saman við óformlegar samræður og skoðanaskipti. Við höfum fjölbreytta dagskrá framundan og það er von okkar að þið megið eiga góðan og gefandi vistfræðidag.

Fyrir hönd undirbúningsnefndar og stjórnar Vistfræðifélagsins

Ingibjörg Svala Jónsdóttir, formaður

DAGSKRÁ / PROGRAM

09:00 SETNING - OPENING
Ingibjörg Svava Jónsdóttir

09:05 AGNAR INGÓLFSSON – A PIONEER IN MARINE ECOLOGICAL RESEARCH IN ICELAND
Jörundur Svavarsson

09:30 MÁLSTOFA I - SESSION I
Fundarstjóri: Ágústa Helgadóttir

- 09:30 E1 **Current reproductive collapse and diet of Icelandic Atlantic Puffins: A cyclic temperature dependent mechanism?**
Erpur Snær Hansen
- 09:45 E2 **Population density, diel activity, and growth in juvenile Arctic charr (*Salvelinus alpinus*)**
Amy Fingerle
- 10:00 E3 **Long term wind erosion in Iceland**
Pavla Dagsson Waldhauserova

10:15 KAFFI - COFFEE

10:45 MÁLSTOFA II - SESSION II
Fundarstjóri: Ana J. Russi

- 10:45 E4 **Repeatability and ecological correlates of foraging and mobility by Arctic charr *Salvelinus alpinus*.**
Nicolas Larranaga
- 11:00 E5 **Bryophyte-vascular plant-herbivore interactions affect tundra responses to climate change**
Ingibjörg Svava Jónsdóttir
- 11:15 E6 **Discriminating between herring populations**
Lisa Anne Libungan
- 11:30 E7 **Sound production and behaviour of humpback whales (*Megaptera novaeangliae*) on feeding grounds in NE-Icelandic waters**
Arnar Björnsson
- 11:45 E8 **Do environmental factors guide selection of overwintering locations in Atlantic herring when learning opportunities are few?**
Jed Macdonald

12:00 HÁDEGISMATUR - LUNCH

13:00 AÐALFUNDUR VISTÍS - ECOICE ANNUAL MEETING
Fundarstjóri: Erpur Snær Hansen

13:45 MÁLSTOFA III - SESSION III
Fundarstjóri: Edwin C. Liebig

- 13:45 E9 **Evolutionary status of the redpoll subspecies *Carduelis flammea islandica* (Aves: Passeriformes: Fringillidae)**
Julien Amouret
- 14:00 E10 **Vatnsformfræðilegir eiginleikar og vistfræði vatns.**
Gerður Stefánsdóttir
- 14:15 E11 **Multi-annual changes in the parasite community of the rock ptarmigan**
Ute Stenkewitz
- 14:30 E12 **Correlates of large-scale variation in breeding output of greylag geese in Iceland**
Helgi Guðjónsson

14:45 KAFFI - COFFEE

15:15 MÁLSTOFA IV - SESSION IV
Fundarstjóri: Silke Werth

- 15:15 E13 **Dreifing álfta frá æskuslóðum.**
Ólafur Einarsson
- 15:30 E14 **Djúpfiskasamfélög í Grænlandssundi**
Klara Björg Jakobsdóttir
- 15:45 E15 **Iceland and Ocean Acidification: are Calcifiers in need of Prozac Súrnun sjávar við Ísland: Þarf kalkmyndandi lífríki kvíðastillandi?**
Hrönn Egilsdóttir
- 16:00 E16 **Value of seabird research in a sea of climate change**
Freydís Vigfúsdóttir

16:15 VEGGSPJALDAKYNNINGAR OG LÉTTAR VEITINGAR Í ÖSKJU - POSTER SESSION AND REFRESHMENTS IN ASKJA

VEGGSPJÖLD / POSTERS

- V1 **Moss layer affects soil processes and interacts differently with vascular plant growth forms in Icelandic tundra ecosystems**
Agústa Helgadóttir, Kristín Svavarsdóttir, Rannveig Guicharnaud og Ingibjörg Svala Jónsdóttir
- V2 **Grjótkrabbi (*Cancer irroratus*) við Ísland**
Óskar Sindri Gíslason, Halldór Pálmar Halldórsson, Snæbjörn Pálsson og Jörundur Svavarsson
- V3 **Árstíðabundinn breytileiki í fjöruvistum á Reykjanesi**
Sunna Björk Ragnarsdóttir, Sölvi Rúnar Vignisson, Iris Mýrdal Kristinsdóttir, Halldór Pálmar Halldórsson og Gunnar Þór Hallgrímsson
- V4 **Nest parasites community in two different eider colonies in West Iceland.**
Þórður Örn Kristjánsson
- V5 **Gróður þar sem hita gætir í jörðu**
Ásrún Elmarsdóttir
- V6 **Erfðabreytileiki beitukónga (*Buccinum undatum*, Gastropoda: Buccinidae) við Ísland: í landslagi Norður Atlantshafsins**
Hildur Magnúsdóttir, Snæbjörn Pálsson, Sigrún Reynisdóttir, Zophonías O. Jónsson og Erla Björk Örnólfsdóttir
- V7 **Temperature related differences in macroinvertebrate communities in streams**
Elísabet Ragna Hannesdóttir, Gísli Már Gíslason, Jón S. Ólafsson og Rakel Guðmundsdóttir
- V8 **Transcriptome-based analysis of stress responses in a lichen fungus**
Silke Werth og Ólafur S. Andrésson
- V9 **Effects of Sheep Grazing on Moss Layer Depth Depend on General Growing Conditions**
Edwin C. Liebig, Martin A. Mörsdorf, Þóra Ellen Þórhallsdóttir og Ingibjörg Svala Jónsdóttir
- V10 **The Impact of Herring Mass Mortality on Benthic Fauna in a Small Icelandic Fjord**
Valtýr Sigurðsson, Róbert A. Stefánsson, Jón Einar Jónsson, Árni Ásgeirsson og Jörundur Svavarsson
- V11 **Community composition and diversity of N₂-fixing cyanobacteria associated with mosses in subarctic ecosystems**
Ana Judith Russi Colmenares, Ingibjörg Svala Jónsdóttir og Ólafur S. Andrésson
- V12 **Extremely rapid colonization in the wake of glacial retreat at outlet glaciers of Vatnajökull, SE Iceland.**
Ólöf Birna Magnúsdóttir, Kristín Svavarsdóttir og Þóra Ellen Þórhallsdóttir
- V13 **Spleen and bursa mass of rock ptarmigan *Lagopus muta* in relation to parasite infections, age, sex, year, and ptarmigan density**
Ute Stenkewitz, Ólafur Karl Nielsen, Karl Skírnisson og Gunnar Stefánsson
- V14 **Atlas of Icelandic cod spawning sites**
William Edward Butler, Lorna Taylor, Jón Sólmundsson og Guðrún Marteinsdóttir
- V15 **Proglacial vegetation succession: a test of the space-for-time approach at Skaftafellsjökull, Iceland**
Þóra Ellen Þórhallsdóttir og Kristín Svavarsdóttir
- V16 **The size of the population of Atlantic Puffin breeding in Iceland**
Erpur Snær Hansen, Arnþór Gardarsson og Kristján Lilliendahl

MINNING / IN MEMORIAM



Agnar Ingólfsson, 29.07.1937-10.10.2013

Agnar Ingólfsson – a pioneer in marine ecological research in Iceland

Agnar Ingólfsson, professor emeritus, passed away on the 10th of October 2013, 76 year old. Agnar was Associate professor (dósent) in Zoology at the University of Iceland from 1970 to 1973 and then full professor in Ecology from 1973 to 2007. Agnar was a pioneer in marine ecological research in Iceland, focussing mainly on the intertidal during the latter part of his life. His contributions to science were highly significant. His most noteworthy work may be his elucidation of floating algae as a habitat, his evaluation of the community structure of the Icelandic intertidal, and his comparison of intertidal community structure in different and distant regions. The lecture focuses on Agnar's research and his contribution to science during the latter part of his life.

Jörundur Svavarsson

Department of Life and Environmental Sciences, University of Iceland

ÁGRIP ERINDA / PRESENTATIONS ABSTRACTS

E1 Current reproductive collapse and diet of Icelandic Atlantic Puffins: A cyclic temperature dependent mechanism?

Erpur Snær Hansen¹ og Arnþór Gardarsson²

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Current Atlantic Puffin *Fratercula arctica* chick production and diet was studied in 12 colonies around Iceland in 2010-2013 and in Vestmannaeyjar archipelago since 2007, using IR-illuminated video probes and digital photography respectively. The results reflect Iceland's two oceanic regimes: the Atlantic seawater southern region (with 75% of the population); and the Arctic seawater northern region. Chick production was good in the north and sandeel *Ammodytes marinus* the main prey. In contrast, south has had poor reproduction and famine for 11 years terminating its immature population. Diet of breeders from both regions was examined in 2012 using stable isotope analysis (¹⁵N and ¹³C) from summer and winter tissues and nestlings. Preliminary results will be introduced as available. Puffin harvest in Vestmannaeyjar 1880-2010 shows a strong relation to sea temperature. The temperature pattern reflects the AMO (Atlantic Multi-decadal Oscillation) cycle, with a 3°C difference between the warm and cold periods in March. A critical sandeel size threshold (L_{th}) was calculated for Vestmannaeyjar 1880-2012¹. The threshold specifies the minimal body length required for survival (and baseline for reproductive energy investment) given the heat profile the sandeels experience during their first winter. An impressive inverse relationship between L_{th} and Puffin harvest is revealed suggesting that L_{th} might be a key mechanism of relating sandeel population changes to temperature changes. 1. Mikael van Deurs, Martin Hartvig, og John Fleng Steffensen. Critical threshold size for overwintering sandeels (*Ammodytes marinus*). *Marine Biology* **158**: 2755-2764 (2011)

E2 Population density, diel activity, and growth in juvenile Arctic charr (*Salvelinus alpinus*)

Amy Fingerle¹, Nicolas Larranaga^{1,2} og Stefán Óli Steingrímsson¹

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Intraspecific competition plays a significant role in shaping how stream-dwelling fishes share and use habitats in time. Many studies suggest that population density may affect territory size and territorial behavior in salmonids. However, salmonids may also respond to competition by modifying their diel activity. We tested for the effect of population density on diel activity and growth in juvenile Arctic charr (*Salvelinus alpinus*) in Iceland. Individually-tagged fish were stocked in stream enclosures at high (6 fish/m²) and low (2 fish/m²) density. During each of two 2-week experimental rounds, an observer noted the identity of all active fish within each enclosure every three hours over seven 24-hour cycles. Despite low activity overall, there were significantly higher rates of activity at high density (14.0%) than at low density (10.5%), indicating that fish spend more time foraging to meet their metabolic demands when competition increases. At both high and low density, fish were most active at night, though fish at high density showed significantly greater crepuscular activity than fish at low density. Individual growth rates were unaffected by population density. This study suggests that to obtain a more comprehensive understanding of the role of competition in fish populations, it is not only necessary to examine spatial patterns (e.g. territory size), but also how individuals may modify temporal aspects of their foraging activity to ensure access to resources.

E3 Long term wind erosion in Iceland

Pavla Dagsson Waldhauserova^{1,2}, Olafur Arnalds¹, Haraldur Olafsson², Johann Thorsson³ og Elin Fjöla Thorarinsdóttir³

¹*Faculty of Environment, Agricultural University of Iceland, Hvanneyri, Borgarnes, IS 311, Iceland.*

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Iceland is an island where volcanic sandy deserts and glacially derived sediments cover over 21% of the country. Affected by strong winds, such areas undergo severe wind erosion and dust particles are carried by air currents distances of several hundred km. We used meteorological observations (synoptic codes for dust and visibility) to identify the frequency and severity of dust-storm events in Iceland. The annual mean of dust days in 1949-2011 was >34 dust days per year placing Iceland among the most active desert regions around the world. The most dust-active decade in NE Iceland was 2000-2010. Winter and sub-zero temperature dust events are often in the southern part of Iceland. We have measured saltation and aeolian transport during storms in Iceland which give some of the most intense wind erosion events ever measured. Severe dust storms occurred after the 2010 eruption in the Eyjafjallajökull area, impacting the land degradation several years after the event. Dust affects the ecosystems over much of Iceland, providing new, un-weathered materials on the surface. It is likely to affect the ecosystems of the oceans around Iceland, and it brings dust that lowers the albedo of the Icelandic glaciers, increasing melt-off due to global warming.

E4 Repeatability and ecological correlates of foraging and mobility by Arctic charr *Salvelinus alpinus*.

Nicolas Larranaga^{1,2}, Amy Fingerle¹ og Stefán Óli Steingrímsson¹

¹*Hólar University College, Department of Aquaculture and fish biology, Sauðárkrúkur, Iceland*

²*Institute of Life and Environmental Science, University of Iceland, Reykjavik, Iceland*

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When searching for prey, animals exhibit sedentary, mobile, or intermediate foraging tactics. The benefits of a particular foraging mode vary when ecological conditions change, but individuals may or may not respond behaviourally to such changes. Arctic charr are mostly “sit-and-wait” predators that initiate burst attacks on drifting prey, but sometimes adopt a more mobile tactic. Although correlations between foraging mode and certain ecological variables (current velocity, food availability) have been investigated, other determinants such as water temperature and light intensity have received less attention. In a field experiment, we collected repeated measurements of foraging mode of 1+ Arctic charr in stream enclosures eight times per day at three hour intervals. In addition, we collected data on foraging rates

and location (benthic, midwater, or surface). Traits related to prey attack (foraging rate, foraging radius, proportion of surface feeding) were repeatable within individuals, but mobility traits were not. Search mobility, foraging radius and proportion of surface feeding decreased with water temperature, but increased with light intensity. This study suggests that (i) individuals use water temperature and light intensity as separate cues to adjust foraging tactics and (ii) that attack behaviours may be better predictors of inter-individual differences in foraging mode than those related to searching.

E5 Bryophyte-vascular plant-herbivore interactions affect tundra responses to climate change

Ingibjörg Svala Jónsdóttir, Ana Judith Russi Colmenares, Ágústa Helgadóttir, Edwin C. Liebig, Martin A. Mörsdorf og Thecla Mutia

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Bryophytes dominate vegetation in many habitats of arctic and subarctic tundra. Recently, their key role in ecosystem functioning in these tree-less landscapes has received increased attention. Soil temperature, diurnal and seasonal temperature fluctuations and soil moisture depend on the depth and composition of the bryophyte layer which strongly influences soil microbial activity, nutrient and carbon fluxes. The bryophyte layer hosts range of organisms (cyanobacteria, algae and invertebrates) that further contribute to these fluxes. The interaction between bryophytes, vascular plants and large herbivores add to this complexity. Vascular plants shade out certain species and life forms of bryophytes while bryophytes affect vascular plant growth and recruitment. Large herbivores affect the bryophyte layer, indirectly through consumption of vascular plants and directly through grazing and trampling. These complex interactions affect ecosystem responses to climate change.

E6 Discriminating between herring populations

Lísa Anne Libungan¹, Guðmundur J. Óskarsson² og Snæbjörn Pálsson¹

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Atlantic herring may have the most complex population structure of any marine fish species where populations are defined based on where and when they spawn. Atlantic herring often share the same morphological body features regardless of origin, making it problematic to estimate the contribution of each population in mixed fisheries. The aim of this study was to evaluate otolith shape as a population marker for Atlantic herring. Otolith shape was studied among several herring populations both at large and small geographic scales. The otolith shape was obtained using quantitative shape analysis, transformed with Wavelet and analysed with multivariate methods. Clear differences were detected among seven herring populations separated by large distances in the NE-Atlantic and among three populations found in a small region in S-Norway. Results show that otolith shape is a powerful

marker to study the dynamics and identity of Atlantic herring populations, and the technique can be applied to other fish species as well.

E7 Sound production and behaviour of humpback whales (*Megaptera novaeangliae*) on feeding grounds in NE-Icelandic waters

Arnar Björnsson^{1,2}, Edda Elísabet Magnúsdóttir^{1,2}, Marianne H. Rasmussen² og Jörundur Svavarsson¹

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The humpback whale is a migratory species which possesses a complex sound repertoire. This ranges from simple non-song sounds, referred to as social sounds, to complex mating songs. Non-song sounds have been reported on their feeding and breeding grounds. There is a considerable lack of understanding about the role of these non-song sounds due to relatively few publications, especially from high latitude feeding grounds. The aim of this research is to gain better understanding on the role of these social sounds on a high latitude feeding ground. The sound behaviour was studied in relation to their visually observed behaviour, on summer feeding grounds in Skjálfandi Bay, NE-Iceland. Passive acoustic recordings, and video recordings of surface behaviour, were conducted simultaneously in the periods of July-August 2012, and June-July 2013. A custom made hydrophone was used during the earlier period at a depth of 8.5 m, and a Reson hydrophone during the latter period at depths of 15 m and 20 m. The observation of each humpback whale, video commentary, whale ID from footage, and GPS data, were combined to get a clear assessment of the behaviour of the observed whales. Each detected vocalization will be inspected visually and aurally, using a spectrogram sound analysis software. Statistics will then be used to determine correct classification of vocalization types. This combined, has the purpose of getting synchronized behaviour and acoustic results, for sound associated behaviour.

E8 Do environmental factors guide selection of overwintering locations in Atlantic herring when learning opportunities are few?

Jed Macdonald, Kai Logemann, William Edward Butler, Niall McGinty, Þorsteinn Sigurðsson og Guðrún Marteinsdóttir
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Accurate predictions on how fish behave in response to changes in their physical environment are central to the effective management of commercially harvested stocks. Here, we explored how oceanographic forces have influenced the distribution of the Icelandic summer spawning herring (*Clupea harengus*) stock over a 22-year time series (1991-2012). Large shifts in the overwintering (non-feeding) location of the stock have been observed during this time; however, the

factors governing these shifts remain uncertain. Commercial catch data from the autumn/winter purse seine fishery were compiled and boosted regression tree models were used to examine the influence of local- and regional-scale oceanographic features on herring capture probability and abundance patterns. Herring were more likely to be captured in warmer, shallower locations at salinities between 33.8 to 34.4. Models fitted for each fishing season independently showed best predictive performance in years coinciding with changes in overwintering location, and performed poorly when traditional migration patterns were maintained. The adopted migrant hypothesis contends that guidance from older cohorts drives selection of wintering locations. Our data support this hypothesis, but also suggest that when learning opportunities are limited, environmental factors may become 'unmasked' and play an important role in determining new migration routes.

E9 Evolutionary status of the redpoll subspecies *Carduelis flammea islandica* (Aves: Passeriformes: Fringillidae)

Julien Amouret, Gunnar Þór Hallgrímsson og Snæbjörn Pálsson

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The Icelandic redpoll *Carduelis flammea islandica* is one of three subspecies of *Carduelis flammea*. The other two are *C.f.rostrata*, breeding in Greenland, and *C.f.flammea*, widely distributed at high latitudes in both N-America and Eurasia. Recent studies on variation of the mtDNA control region and in microsatellites among *C.f.rostrata* and *C.f.flammea* mainly from Scandinavia and related species (*C.hornemanni*, *C.cabaret*) didn't reveal clear genetic differentiation among the species. The lack of differentiation could result from introgression (hybridization has been supported by direct observations) and/or incomplete lineage assortment following recent diversification. Here we add result of the Icelandic subspecies *C.f.islandica* to previous analysis of the species complex to evaluate its reproductive isolation. The Icelandic subspecies is particularly interesting because of its intermediate size and colour between the two extreme forms; *C.cabaret* and *C.hornemanni*. This study includes in addition a comparison of different and highly variable genetic markers: mitochondrial (control region and COI) and nuclear introns (TGFβ2, Fib7, Brm-13, Rho, Ghr and Alas). Significant differences in haplotype frequencies of the mtDNA control region are observed between the Icelandic subspecies and the common redpoll (*C.f.flammea*).

E10 Vatnsformfræðilegir eiginleikar og vistfræði vatns.

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Vistfræði straumvatna og stöðuvatna ræðst af flóknu samspili margslunginna lífrænna og ólífrænna þátta. Breyttar ytri aðstæður geta gjörbreytt vistkerfum. Lengst af hafa áhrif mannsins á vistkerfi vatna verið fremur lítil, en frá iðnbýltingunni hefur það álag aukist með veldisvexti. Fram til þessa hefur álag á vatn einkum verið skoðað með hliðsjón af efnamengun og ástandið metið út frá styrk mengandi efna í nágrenni við mengandi uppsprettur. Í nýjum lögum um stjórn vatnamála (36/2011) er hugtakið álag útvíkkað og nær það einnig til vatnsformfræðilegra atriða, svo sem breytinga á vatnsfarvegum og afrennsli. Í lögnum er einnig kveðið á um að reynt skuli að skilgreina eðlisfræðilegar og formfræðilegar breytingar og meta möguleg áhrif þeirra á vistgerð vatna. Fjallað verður um skilgreiningu vatnsformfræðilegra breyta samkvæmt lögnum. Þá verður farið yfir mögulegar leiðir til að meta vatnsformfræðilegt álag við íslenskar aðstæður. Kynnt verður aðferðafræði við rennslisgreiningu straumvatna og gefin dæmi um rennslisvísa sem gætu nýst til að skilja betur eiginleika og uppruna vatns og mætti hugsanlega nota við mat á ástandi vistkerfa. Mikilvægt er að nota fyrirbyggjandi gögn við gæðamatið að því marki sem þau henta. Þá þurfa framtíðaráherslur við vöktun á ástandi vatns að taka mið af þeim skyldum sem lögin kveða á um.

E11 Multi-annual changes in the parasite community of the rock ptarmigan

Ute Stenkewitz^{1,2,3}, Ólafur Karl Nielsen¹, Karl Skírnisson² og Gunnar Stefánsson⁴

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Parasite communities of wildlife species have rarely been studied over an extended time period. This type of knowledge can give useful insight into many aspects of parasite ecology and host-parasite interactions, the latter being one of the driving forces of multiannual cycles in wildlife populations. The Icelandic rock ptarmigan population shows multiannual cycles with peak numbers roughly every 10 years. The parasite fauna of the ptarmigan has recently been described and currently 16 species of parasites are known. The aim with this research has been to extend the current knowledge and describe parasite infections of the ptarmigan for different age groups over seven years to see how this relates to ptarmigan body condition and population density. We collected 632 ptarmigan in northeast Iceland in October 2006-2012, out of which 631 (99.8 %) were infected with at least one parasite species. Juvenile birds carried more parasites overall than adults. Spring ptarmigan densities reflected the birds' body condition from the previous October, but preceded trajectories of parasites, in particular that of coccidians in juvenile birds, by approximately two years. This observation in juvenile birds is of interest as changes in "juvenile excess mortality" drive the ptarmigan cycle in a demographic sense. Up to now, the pattern observed is consistent with the

hypothesis that parasites may be one contributing factor driving the ptarmigan population cycle in Iceland.

E12 Correlates of large-scale variation in breeding output of greylag geese in Iceland

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Each year about 40 thousand Greylag Geese on average are shot in Iceland from a population that is estimated to be about 105 thousand birds. This is a significant portion of the population and it is necessary to preserve the nesting habitat if the population is to support such hunting pressure. The aim of the study is to produce a large-scale comparison of parameters that relate to breeding output (timing of breeding, clutch size and brood sizes) and identify sources of variation at spatial and temporal scales. Field work was conducted between May-August in 2012-2013. The research areas were distributed around Iceland. Nesting began first in the South and West part of Iceland then North and then lastly in the East, but there was no variation between years. East Iceland had significantly fewer goslings for each family than the other research areas but the South and West parts showed a significant decrease in goslings between years.

E13 Dreifing álfra frá æskulóðum.

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Íslenski álfstafinn, sem nú telur um 29.000 fugla, dvelur að mestu leyti á Bretlandi og Írlandi yfir vetrartímam, en 500-1300 álfir þreyja þorrann og góuna á Íslandi. Reglulegar merkingar á álfum hófust árið 1980, en síðan 1988 hafa þær verið litmerktar á athugunarsvæðum í Þingeyjar-sýslum, Skagafirði og Jökuldalsheiði. Álfir hafa einnig verið litmerktar í friðlöndum Wildfowl & Wetlands Trust á Bretlandi síðan 1979. Litmerkingar gera það kleift að hægt er að lesa á merki úr fjarlægð og fylgjast með einstaklingum um árabíl eða svo lengi sem litmerkin endast. Í þessari rannsókn er dreifing álfra, sem merktar voru sem ungar, skoðuð og hvort eitthvert mynstur sé í dreifingu kynja frá æskulóðum. Þróunarfræðilega má gera ráð fyrir því að annað kynið ætti að setjast að fjarri æskulóðum til þess að minnka líkurnar á skyldleikaræktun.

E14 Djúpfiskasamfélög í Grænlandssundi

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Fiskveiðar hafa verið stundaðar á miklu dýpi í landgrunnshallanum vestan við Ísland í marga áratugi og helstu tegundir sem veiðast þar eru grálúða og djúpkarfi ásamt gulllaxi og blálöngu. Lítið er þó vitað um fiskasamfélögin á þessum slóðum í heild sinni eða um fjölbreytni þeirra. Hafrannsóknastofnun stendur fyrir árlegri stofnmælingu botnfiska að haustlagi (SMH) þar sem, meðal annars, gögnum er safnað á fjölmörgum stöðum í landgrunnshallanum (300-1300m). Fimmtán ára tímaröð gagna úr þessum stofnmælingum var notuð til að lýsa djúpfiskasamfélögum í landgrunnshallanum vestan við Ísland og fjölbreytni þeirra. Á tímabilinu fundust 133 tegundir fiska úr 71 ættbálkum, 25 ættum og 5 flokkum. Fimm algengustu tegundir á svæðinu reyndust vera slétthali, djúpkarfi, gulllax, grálúða og gjölnir. Breytileiki í fjölda nytjategundanna á svæðinu var í samræmi við þróun þessara stofna í heild sinni. Samstíga fækkun grálúðu yfir tímabilið fækkaði tveimur algengum meðalategundum hennar (svartháfur og nefbroddabakur) á meðan einni fjölgandi (djúþáll). Einnig sýndu niðurstöður að dýpi og svæði voru stærstu áhrifaþættir á fjölbreytni fiskasamfélaganna og að við 700m dýpi virðist aðgreining í eiga sér stað í tegundasamsetningu og í breytingum þar á yfir tímabilið sem rannsóknin spannar. Vistkerfi og fiskasamfélög djúpsjár eru enn lítið rannsökuð hér við land. Mikilvægt er að öðlast betri þekkingu á þessum samfélögum og fjölbreytni þeirra svo að skilja megi betur vistfræðileg tengsl í hafinu og áhrifaþáttum þar á.

E15 Iceland and Ocean Acidification: are Calcifiers in need of Prozac Súrnun sjávar við Ísland: Þarf kalkmyndandi lífríki kvíðastillandi?

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Landsvæði Íslands er um 103.000 km² að stærð en efna-hagslögsaga landsins er meira en sjöfalt stærri, eða 758.000 km². Vistkerfið í hafinu er að mestu falið sjónum þrátt fyrir stærð sína. Að þessu vistkerfi stöðvar nú ósýnileg ógn vegna útblásturs mannkyns á koldíoxíði sem er að valda súrnun sjávar og lækkandi kalkmettun í hafinu. Vegna lágs hitastigs eru breytingarnar hraðar við Ísland og er kalkmettun náttúrulega lág. Því gætu afleiðingarnar fyrir vistkerfið í hafinu við Ísland orðið sérstaklega alvarlegar. Kalkmettun í hafinu minnkar almennt með dýpi og hita. Á ákveðnu dýpi leysist kalk upp og eru þar efnafræðileg metnunarmörk kalksins skilgreind, þ. e. a. s. $\Omega = 1$. Vegna lágs hita eru metnunarmörk kalks í Íslandshafi lág og langtímamælingar sýna vel hvernig efnafræðileg metnunarmörk kalks $\Omega = 1$ eru að grynna; t.d. eru

metnunarmörk aragóníts að grynna um 4 metra á ári (nú á um 1700 m dýpi) sem jafngildir því að við undirmettuð hafsvæði bætast um 800 km² af hafsbotni ár hvert. Kalkmettun skiptir þær lífverur sem framleiða kalk miklu máli en efnafræðileg metnunarmörk kalks eru ekki endilega þau sömu og vistfræðileg mörk kalkmettunar. Sem dæmi þá virðast hlýsjávarkóralar takmarkast við mjög háa kalkmettun (u.þ.b. $\Omega = 3$), ostrur á vesturströnd Bandaríkjanna takmarkast við $\Omega = 1.2$. Í þessu erindi verður farið yfir það hvaða kalkmyndandi lífverur finnast á hafsbotni við Ísland. Reynt verður að skilgreina vistfræðileg mörk kalkmettunar fyrir nokkrar gerðir hryggleysingja og spáð fyrir um framtíðarhorfur þeirra.

E16 Value of seabird research in a sea of climate change

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In recent years, understanding the impacts of global changes in environmental and climatic conditions has become one of the principal challenges facing the scientific community. Climate-driven environmental changes are predicted to be particularly severe at high latitudes, where fragile ecological systems may be severely disrupted by changing temperatures, sea level rise and glacial retreat. In terrestrial environments, numerous studies have indicated climate-related shifts in species distribution, range size and demography, but the effects of climate change on the world's largest ecosystem, the marine pelagic realm, are less well understood. The effects of climatic variation on marine ecosystems are complex to unravel because of their large scale and dynamic complexities, and because ocean research is costly and time consuming. Consequently, most reports on climate-related changes in marine systems have focussed on commercially exploited species and related subjects. Identifying ecological systems and species that operate as indicators of environmental changes in the marine ecosystem can provide opportunities to understand the impact of changes to these environments. Higher predators are often of particular value as indicator species, as they are sensitive to changes throughout the ecosystem. Seabird populations have provided some of the clearest evidence for changes in marine ecosystems, and many breeding populations of seabirds have declined in productivity and abundance in recent decades. Iceland supports a very large proportion of the breeding seabirds of the North Atlantic region and, while there are very limited regular and systematic surveys of seabird abundance and demography in Iceland, there is evidence of recent declines in several species, particularly those dependent on small, high-energy fish species such as sandeels. In this talk I will review some of the challenges we face in near future in relation to on going and predicted changes in the marine environment and show examples of value of seabird research in this regard, as an input into the discussion on research priorities in the future.

ÁGRIP VEGGSPJALDA / POSTER ABSTRACTS

V1 Moss layer affects soil processes and interacts differently with vascular plant growth forms in Icelandic tundra ecosystems

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Erosion is a serious problem in Iceland. Successful restoration of moss dominated heathlands demands understanding of the role of mosses in that process. We tested the following hypotheses: 1) At an early restoration stage shallow moss layer stimulates soil processes, and 2) as moss layer depth increases at later stages, its insulation slows down the processes and affects the growth and reproduction of vascular plants. Relationships between moss depth and selected soil properties were examined along a chronosequence in the Icelandic highlands: eroded heathland, 30 years old restoration site and intact dwarf birch heath. The interaction between moss layer and four native vascular plants was studied in a moss removal experiment. The results show that the moss acts as an insulator for soil temperature and retains soil moisture, hence increases soil microbial biomass carbon and nitrogen availability in the chronosequence. Vascular plant responses to moss removal depend on growthform.

V2 Grjótkrabbi (*Cancer irroratus*) við Ísland

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Grjótkrabbi (*Cancer irroratus*) er nýr landnemi við Ísland. Hann er tiltölulega stórvaxinn krabbi sem getur orðið allt að 15 cm á skjaldarbreidd. Tegundin fannst fyrst hér við land í Hvalfirði árið 2006, en fyrir þann tíma var útbreiðsla hans aðeins þekkt í Norður-Ameríku, frá Labrador til Suður-Karólínu. Talið er líklegast að tegundin hafi borist hingað til

lands á lirlustigi í kjölfestuvatni skipa. Rannsóknir á tegundinni hér við land hafa m.a. snúið að tilraunaveiðum á fullorðnum dýrum, lirlufroskun, þéttleika lirla í uppsjó, stofnstærðarmati og erfðabreytileika krabbans. Grjótkrabbin er orðinn útbreiddur við SV og V strönd Íslands. Lirlur krabbans hafa fundist í miklu magni í Hvalfirði og innanverðum Faxaflóa en að auki hafa nokkrir einstaklingar greinst í sýnum úr Patreksfirði. Lirluféttleiki er lágur fyrri part sumars en nær hámarki í júlí og dregur svo úr er líður fram á haust. Erfðabreytileiki innan íslenska stofnsins sýnir engin skýr merki um landnemaáhrif, hann er svipaður og í amerískum samanburðarstofnum en er þó erfðafræðilega frábrugðinn þeim. Hár breytileiki og vaxtarhraði íslenska stofnsins gefa til kynna að hann sé lífvænlegur og þrífist vel við Ísland.

V3 Árstíðabundinn breytileiki í fjöruvistum á Reykjanesi

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Staða þekkingar á lífríki íslenskra fjara er samandregin í Zoology of Iceland (Agnar Ingólfsson 2006). Þar er að finna lýsingu á samsetningu lífvera í helstu fjörugerðum landsins. Lítið er hins vegar vitað um árstíðabundinn breytileika í samfélagsgerð smádyra í íslenskum fjörum og fjöldi lykillífvera innan fjörugerða nánast óþekktur hérlandis. Nú standa yfir rannsóknir á árstíðabundnum breytileika meðal fjörulífvera þar sem meðal annars er leitast við að varpa ljósi á þessa þætti innan skilgreindra vistgerða fjörunnar. Sýnatökur fóru fram í Sandgerði á Reykjaneskaga í byrjun hvers mánaðar frá febrúar 2013 fram í mars 2014. Í grýttum fjörum var lögð áhersla á klapparþangsbelti (*Fucus spiralis*) og klóþangsbelti (*Ascophyllum nodosum*). Í setfjörum (leira/sandur) var fylgst með breytingum á þremur hæðarbilum í fjörunni. Frumniðurstöður gefa til kynna að þær tegundir sem eru í mestu magni sýna mjög greinilega árstíðabundna sveiflu þar sem fjöldi þeirra

eykst gríðarlega á sumrin en misjafnt er hversu langt fram á árið uppsveiflan varir. Sem dæmi má nefna fjölda þangdoppa (*Littorina obtusata*) í klapparþangi sem fór úr 13 einstaklingum á 100g þangs í maí 2013 upp í 103 einstaklinga í september sama ár. Dæmi um árstíðarbundnar breytingar í sandfjöru er fjöldi burstaorma inna hópsins *Capitella capitata* sem fór úr 66 einstaklinum (að meðaltali í 155ml sands) í maí 2013 í 890 einstaklinga í ágúst sama ár. Ljóst er að ástíðasveifla og fjöldi og magn lykíllíffvera eru undirstöðuupplýsingar og nauðsynlegt að þær séu til staðar fyrir frekari rannsóknir á vistfræði íslenskra fjara.

V4 Nest parasites community in two different eider colonies in West Iceland.

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Bird nests that persist for many years are frequently inhabited by invertebrates such as fleas, lice, ticks and mites which can negatively affect the fitness of the incubating birds. Little is still known of how densities and species composition of the parasites relates to habitat selection or habitat use of the birds, and consequently their means to lower these negative effects. The invertebrate fauna of nests (down and bottom material) of the common eider (*Somateria mollissima*) was compared between two eider colonies in Breidafjörður, West Iceland, i.e. in one sparsely nested offshore colony (Hvallátur) and in one densely nested coastal colony (Rif). The invertebrate communities at both sites had low species diversity and were dominated at both sites by the flea *Ceratophyllus garei*, which was observed in all nests investigated at high densities. The tick *Ixodus uria* was also found at both sites but in much lesser abundance. Higher densities of fleas and mites were seen at the nests at the sparse offshore eider colony at Hvallátur, than in the dense coastal colony in Rif. Other organisms found were non-parasitic insects and soil mites (Acari: Oribatida) which were probably associated with the bottom material in the nest bowls or the soil. There was no relationship between species or abundance of fleas and the nest materials (red fescue grass, marram grass and dry brown seaweed). These differences are probably mostly related to the behavior of the females, rather than to the density of the colony or the offshore/inshore location of the colony.

V5 Gróður þar sem hita gætir í jörðu

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Þar sem jarðhita gætir setur hann oftast en ekki mikinn svip á landið og á hálandinu sker gróður við jarðhita sig úr í annars hrjóstrugu umhverfinu. Hér á landi eru háhitasvæði um 20 og var gróður rannsakaður á 17 þeirra á árunum 2001-2008. Hár jarðvegshiti við yfirborð skapar aðstæður sem eru ólíkar umhverfinu í kring, t.d. lágt sýrustig og styrkur steinefna og annarra frumefna er ólíkur því sem gerist í öðrum vistkerfum. Ákveðnar tegundir háplantna og mosa eru aðlagðar

þessum aðstæðum og hérlendis eru þekktar nokkrar „jarðhitategundir“, þ.e. tegundir sem þrífast eingöngu eða nær eingöngu á jarðhitasvæðum. Þegar fjallað er um hveragróður er átt við plöntusamfélög sem að samsetningu, byggingu eða framleiðni mótast af jarðvegshita eða þáttum honum tengdum. Jarðhitinn getur haft bæði neikvæð og jákvæð áhrif á gróður og ræður miklu um hvaða tegundir þrífast. Þar sem hiti á nokkurra sentímetra dýpi er allt að 100°C og sýrustig í jarðvegi lágt dregur úr möguleikum plantna á að taka upp næringarefni og hamlar það vexti þeirra. Þar sem jarðvegur er volgur eru aðstæður hins vegar mun hagstæðari og skilyrði til vaxtar oft betri en á köldu landi í kring. Gróður verður því þéttari og gróskumeiri þar sem hiti er í jarðvegi og raki nægur en í köldu landi umhverfis. Níu hveragróðurfélög hafa verið skilgreind á háhitasvæðum hér á landi og þrjár landgerðir; hveraleir, hverahrúður og hraun með útfellingum. Nokkur munur er á jarðhitagróðri eftir hæð yfir sjó, úrkomu og raka í jarðvegi.

V6 Erfðabreytileiki beitukóna (*Buccinum undatum*, Gastropoda: Buccinidae) við Ísland: í landslagi Norður Atlantshafsins

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Beitukóngur er snigill sem lifir frá fjöru að 110 m dýpi og finnst víða í N-Atlantshafi. Hann er þekktur fyrir breytileika í vexti, kynþroskastærð og útlitseinkennum. Þéttleiki beitukóns í Breiðafirði er mikill og hefur tegundin verið nýttuð um áratuga skeið í firðinum. Líffræði beitukóna var könnuð í Breiðafirði á árunum 2007 til 2010 og var lögum beitukóna marktækt frábrugðin á milli svæða. Til þess að kanna stofnerfðafræði beitukóns á gjöfulu svæðum hafsbotns Breiðafjarðar og aðgreiningu hans frá beitukóni á öðrum íslenskum svæðum sem og beggja vegna Atlantshafsins, voru tvö hvatberagen og fimm örtungl rannsökuð og borin saman. Marktækur munur var á tíðni allela og haplótýpa milli beitukóna af nálægum svæðum við strönd Íslands og erfðafræðileg aðgreining jókst eftir því sem fjarlægðin var meiri. Líflandafræðilegt mynstur í hvatberagenunum leiddi í ljós aðskilda stofna í austan og vestanverðu N-Atlantshafi sem hafa skilist að fyrir seinustu ísöld og er hugsanlegt að um dultegundir sé að ræða (cryptic species). Í ár verður rannsóknunum á arfgerð og svipgerð beitukóna haldið áfram. Ætlunin er að kanna hvaða þættir liggja að baki fjölbreyttum útlitseinkennum beitukóns, og samspili umhverfis- og erfða á lit og lögum kuðunganna.

V7 Temperature related differences in macroinvertebrate communities in streams

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Climate change models predict a 0.6 to 4.0°C increase in temperature by the end of the 21st century compared to 1980 to 1999 values. In this study we assessed the impact of warming on invertebrate communities by looking at seven spring-fed streams in the geothermal area Hengill, with water temperatures ranging from 5.3 to 21.3°C. Surber samples were collected over a year, every month during summer but every other month over winter. Temperature and other environmental factors were measured over the sampling period. Epilithic chlorophyll a concentration was measured on each sampling occasion. Invertebrates were counted and identified under a microscope. Biomass of several groups was calculated as the product of density and body mass, which was estimated from length measurements using length-dry mass regression equations. The invertebrate communities were compared using Sørensen index. Redundancy analysis was performed to evaluate which environmental variables explained the variation in the invertebrate communities. The invertebrate communities changes along the temperature gradient, from a community dominated by chironomids to a community of chironomids, simuliids and gastropods. *E. minor* and *Thienemanniella* spp. dominated the cold streams and *S. vittatum* and *R. balthica* the warm ones. Temperature was the only significant environmental variable, explaining 53.4% of the variation in the invertebrate data. Invertebrate biomass increased significantly with increasing temperature.

V8 Transcriptome-based analysis of stress responses in a lichen fungus

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The lichen symbiosis provides a life form that is successful at colonizing large ranges, and tolerates extremes in climate. How do lichens manage to adapt to a multitude of habitats and climatic conditions? One hypothesis is that the symbiotic phenotype of lichens is able to tolerate various environmental conditions owing to changes in gene expression. Here, we investigate gene expression in the lichenized fungus *Peltigera membranacea* using an RNA sequencing approach. In a controlled experiment where we heat stressed the lichens, we focused on genes involved in environmental stress response because these are among the most likely candidates to enable in-situ tolerance in a changing environment. We also present results from gene expression levels of samples gathered in situ. Our results show tremendous variability in gene expression levels between individuals sampled from the same population, indicating that individuals may respond differently to elevated temperatures. Moreover, we

report genes with significant expression differences between heat treatments (5C, 15C).

V9 Effects of Sheep Grazing on Moss Layer Depth Depend on General Growing Conditions

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Mosses play an important role in tundra ecosystems. They may colonize recently disturbed habitats and either act as facilitators or competitors in terms of vascular plant growth. Grazing by large herbivores, such as ungulates, can have strong effects on moss growth, affecting e.g. the depth of the moss layer. The impact of ungulates on plant communities depends on the intensity of grazing and the general growing conditions. However, previous studies have rarely explored the impacts caused to the moss layer. Therefore, our aim is to contribute to a better understanding of how disturbance by ungulates influence the depth of the moss layer under different growing conditions. We conducted a vegetation survey in six grazed and ungrazed valleys in two regions of Iceland, Vestfirðir and Norðurland. The survey was stratified to entities within the valleys that cause different growing conditions, such as, general exposure, elevation, and different topographical entities. We measured moss layer depth in a systematic way. Preliminary results indicate that grazing activity had a strong effect in northeast facing slopes, by decreasing moss layer depth. The grazing effects did not seem to depend on growing conditions determined by elevation or topography.

V10 The Impact of Herring Mass Mortality on Benthic Fauna in a Small Icelandic Fjord

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In the winter of 2012-2013 an event of a herring mass mortality occurred in a small fjord on the Snæfellsnes peninsula in western Iceland. Over 50 thousand tonnes of fish where estimated to have been succumbed to oxygen depletion. As a result benthic macro fauna was observed washed ashore. The aim of this project is to assess the effect of the herring mortality on the benthic macrofauna and compare the results to an earlier research performed in the same area in the year 1999. Samples were taken with a Shipek bottom grab sampler (area 0,04 m²) within the area of interest which is enclosed by a narrow channel that obstructs water exchange in the fjord. Four samples were collected from seven stations, thereof one sediment sample at each station. Comparative samples were obtained outside the channel. Sample sorting and analysis will be in process till late spring 2014. Preliminary results of the sample analysis show a

general reduction in bottom macrofaunal diversity within the channel. At the stations that suffered the heaviest pollution species composition is dominated by one polychaete species *Capitella capitata*. Diversity indexes from the comparative samples and the earlier research mentioned above show more similarities and are three times higher on average. This project is funded by The Icelandic Road and Coastal Administration

V11 Community composition and diversity of N₂-fixing cyanobacteria associated with mosses in subarctic ecosystems

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N₂-fixation in high latitude ecosystems may largely depend on N₂-fixing moss associated cyanobacterial communities (MAC) identity and composition. Therefore we assessed diversity and abundance of MAC associated with four moss species *Racomitrium lanuginosum*, *Hylocomium splendens*, *Pleurozium schreberi* and *Sanionia uncinata*, all abundant in moss-dominated sub-arctic ecosystems in Iceland. Diversity and abundance were estimated by phase-contrast and fluorescence microscopy. Cyanobacterial *nifH* genes were amplified and sequenced for phylogenetic typification. The cyanobacterial strains observed probably all belong to the orders *Nostocales* and *Stigonematales*. Sequencing showed that *Nostoc punctiforme* is the most common cyanobacterial species associated with *R. lanuginosum* and *P. schreberi*, while it has not yet been possible to firmly identify cyanobacteria associated with *H. splendens* and *S. uncinata*. The next step in the study is to relate MAC community composition with N₂-fixing activity.

V12 Extremely rapid colonization in the wake of glacial retreat at outlet glaciers of Vatnajökull, SE Iceland.

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On the southern slopes of Vatnajökull ice cap in SE-Iceland, numerous outlet glaciers descend into a similar mild and humid lowland environment and can be regarded as natural replicates for testing hypotheses on successional drivers and predictabilities. All these glaciers have been retreating at accelerated rates in recent years, up to 100-150 m yr⁻¹. Colonization was extremely rapid at the youngest sites with 29-52 species of vascular colonizers per glacier in less than a decade. There were significant differences among glaciers in species composition and richness and in aboveground cover.

We postulate that this may be related to soil particle size differences. Our results do however not clarify the mechanism behind this, as the role of safe sites, other abiotic factors or a mixture of those was not tested.

V13 Spleen and bursa mass of rock ptarmigan *Lagopus muta* in relation to parasite infections, age, sex, year, and ptarmigan density

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The spleen and bursa of Fabricius in birds are important organs that play a role in fighting parasite infections. The size of these organs has been used by ecologists as a measure of immune investment. The bursa only occurs in juvenile birds whereas the spleen is present in both juveniles and adults. We investigated spleen and bursa mass in relation to parasites for 541 rock ptarmigan *Lagopus muta* collected in northeast Iceland in October 2007-2012. All birds were infested with at least one parasite species. Spleen mass differed between age classes, sex and body condition of adults, and years; juveniles had heavier spleens than adults, adult females had heavier spleens than adult males, and the year effect was significant for juveniles. Variation in bursa mass was related to body condition. Spleen mass was positively associated with increased parasite species richness and abundance, in particular endoparasite abundance. Coccidian parasites were the main predictors. Bursa mass was negatively associated with elevated ectoparasite abundance, in particular of the chewing lice *Lagopoecus affinis* and *Goniodes lagopi*. The two immune defense organs appeared to relate to different stimuli. Spleen mass of juveniles changed in synchrony with ptarmigan body condition and population density over the years of this study, and coccidians traced these trajectories with a c. 2 year time-lag. The spleen is more suitable than the bursa as an indicator of investment in parasite immunity because spleen size is independent of body size, juvenile and adult ptarmigans have spleens, and spleen mass shows significantly positive relationships with measures of parasite infestation.

V14 Atlas of Icelandic cod spawning sites

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The main Atlantic cod (*Gadus morhua*) spawning grounds in Icelandic waters are considered to be along the southwest coast, however the small scale structure within this area is not

well documented and research has shown that areas along the east, north and west coasts also contribute to the surviving pelagic juvenile population. A more detailed understanding of spawning ground structure is required to elucidate egg and larval dispersal pathways, locations of nursery grounds, and the sub-stock structure of cod in Icelandic waters. To achieve this, we explored the distribution of fisheries (demersal trawl and gillnet) and the occurrence of spawning cod confirmed by Marine Research Institute samples between 1991 and 2011. Fifty-five spawning sites were constructed based on aggregations of fisheries records and areas historically delineated by fishermen. Once the optimal spatial structure was identified, survey data were used to estimate the abundance of spawning females per site per year. For all years, the greatest abundance of spawning females is found in Selvogsbanki (southwest) and Breiðafjörður (west), and periodically in Faxaflói (west). Lowest abundance is consistently found along the northern coast. Steep gradients in abundance between adjacent sites, particularly evident in Selvogsbanki, suggest that spawning is a location-specific event rather than being uniformly distributed throughout each spawning ground. The atlas of cod spawning sites put together in this study will be beneficial for future studies looking at the sub-stock structure of cod in Icelandic waters.

V15 Proglacial vegetation succession: a test of the space-for-time approach at Skaftafellsjökull, Iceland

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The long time scales of many ecological processes make direct observations difficult and it may be necessary to adopt other approaches. In succession, space-for-time substitution is a well established practice and many studies, some now regarded as classic, were based on such chronosequences. However, the approach has many caveats and its assumptions and inferences still need critical examination. Here we report

on such a test. In 1962, the Swedish botanist Åke Persson described proglacial chronosequence at successive distances from Skaftafellsjökull glacier, SE Iceland. We relocated Persson's sites in 2009 and repeated his observation as faithfully as possible based on his descriptions and maps. Our analyses indicated that in 1962, the spatial sequence adequately represented the temporal sequence. However, in 2009, the later seral stages defined by Persson were no longer distinguishable. The differences between stages had become blurred and more species than before were found across the seral stages defined by Persson. Rates of change slowed down with time and the oldest plots changed the least in the intervening 47 years. These plots now have scattered *Betula pubescens* but not the sward vegetation that is associated with mature birch forest.

V16 The size of the population of Atlantic Puffin breeding in Iceland

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The first estimate of the total population of Atlantic Puffins *Fratercula arctica* breeding in Iceland is presented. Estimate was based on aerial photography, burrow density counts and burrow occupancy rate measured with IR video probes. Surface area of the colonies was measured from vertical low-level aerial photographs and corrected for slope. Most of the larger colonies were visited for field measurements but regional mean burrow density and BOR were used when local "ground truth" was unavailable. The preliminary population size is 2 million pairs (2.7 million burrows) or 36-40% of the world's population. Of the total 41% breed in the Vestmannaeyjar archipelago. 75% of the population breeds in only 18 colonies (or colony aggregations) with >10.000 pairs.

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