# Why sequence everything? A Raison d’être for the Genome Atlas of Faroese Ecology.

When discussing the Earth BioGenome Project with scientists and potential funding agencies, one common question is why do everything? It’s not an unreasonable question given what we know about the mathematics of importance and Pareto’s 80:20 principle, that 80% of the benefits can come from 20% of the effort. (As a digression, this principle is an observation made in hindsight, and selecting the most effective 20% of experiments is difficult. Also note that the comparative genome analysis of the archaeal *Haloferax mediterranei* in 1995 led to the hypothesis that Crispr repeats might be part of a microbial immune system[1].) Returning to the publication at hand, in every discussion trying to save money by only sequencing favorite species, the Faroe Islands or any of many other smaller countries were never mentioned.

Mikalsen and co-authors give us the strongest argument about why we care, why we care about genetic diversity from a Faroese viewpoint, a fishery viewpoint, and a global viewpoint. As readers, we learn to care about the Faroe islands and people, and perhaps through them all the nature and people of the world.

The manuscript describes the proposed Faroese participation in the European Reference Genome Atlas consortium (ERGA) though Gen@FarE – the Genome Atlas of Faroese Ecology. The three major aims of i) generating high quality reference genomes for all eukaryotes on the islands and in its waters, ii) establish population genetics of all species of interest, iii) establish a “databank” for all Faroese species with citizen science tools for participation.

In the background section, the authors make the argument that as the caretakers of earth, humans must be aware of the biodiversity and existing genetic diversity, so that we can protect these species for future generations. Thus, the necessity of having reference genomes for as many species as possible. I particularly liked the argument “…we will only be able to maintain diversity and exploit it in a sustainable way by being aware of it. It is difficult or impossible to take care of things we do not know.” They also show these same ideas thorough the Convention of Biological Diversity targets, to which the Faroe Islands are a party through the Kingdom of Denmark.

As to the Faroe islands specifically, this small nation has a sizable economic zone in the North Atlantic and large fisheries. In terms of biodiversity and conservation the manuscript lists some of the species endemic to other Faroe islands especially sea birds. They also discuss ongoing marine environmental monitoring eDNA programs started in 2018, and how access to more reference genome databases will help these efforts to track and preserve marine biodiversity. They discuss the lack of use of population genomics information for red list decisions on which species are endangered, but then note the need for these techniques to inform sustainable harvesting of fisheries, given collapses in critical food species such as Northwest Atlantic cod and herring. In particular, they discuss the Herring chromosome 12 inversion containing a “supergene” collection of tightly linked genes associated with ecological adaptation. Genetic tools may also help enable the identification and nurturing of feeding grounds of young individuals. Other ecology/conservation species stories include the lessor sand eel, the greater silver smelt I will leave for the reader, but the Faroe islands can clearly play a significant role in protecting the millions of tons of sea food caught annually that humanity relies upon. As the authors note, population genomics based on high quality references is “likely the best tool” to monitor and protect commercial fisheries. There is an important section discussing the role of the “invisible species” in the marine ecosystem on which we all depend. Planktonic algae, invasive species transported by ballast water or ship hulls, and the micro-evolution of introduced food mammal species.

The authors finish the article with the goal of citizen science. Where initiatives such as the human genome project did not need the buy in of the world for sample access, the Earth BioGenome Project most certainly does, and in the same way at a smaller scale Gen@FarE requires the support and help of the Faroese. The authors finish the manuscript by discussing Gen@FarE plans for citizen science and education, perhaps the most important part of this project if humanity is to care for planet earth.

As this is a perspective kind of article the referees have focused on the writing. I agree with both that perhaps one more round of editing could help this manuscript, and as one reviewer noted the lack of mention of a whale species for which there is a tradition of hunting. I will note a larger limitation. There is no mention of any arthropod, fungi, or vascular plant, but this is not a rainforest habitat, and it is important that the Faroese perform the project as they see fit. Still despite the need for one last edit (which I hope will happen at some point), this manuscript shows the necessity for the Faroe Islands to be a part of the European and earth biodiversity projects from both the Faroese point of view, and a global point of view. In other words, this manuscript shows the necessity to care about the world around us.

References

1. Mojica FJ, Díez-Villaseñor Cs, García-Martínez J, Soria E. Intervening sequences of regularly spaced prokaryotic repeats derive from foreign genetic elements. J Mol Evol. 2005;60:174-82.