## Origin and evolution of extreme life span in Pacific Ocean Rockfishes – Kolora et al. 2021 DOI: 10.1126/science.abq5332

## Presentation summary – László Szalai | BIO555 HT-2024

The secret of longevity is one of the most sought-after mysteries of humankind. Vertebrates experience a life expectancy from 5 weeks up to 400 years therefore a 3 orders of magnitude difference is present within the taxa. Although a large portion of the life cycle alterations can be explained by direct and indirect genetic factors, studying long-lived species remains challenging. However, different rockfish (a part of the vertebrate taxa) subspecies experiences a life span from 11 to 200 years due to evolutionary changes in their genome, environmental effects and their interactions. This could present a unique opportunity to visualize the underlying genetic forces acting on and favoring longevity which is the aim of this research.

Gathering the core data, 102 individual rockfish representing 88 subspecies within the taxa have been sequenced and their genome de novo assembled with a 99.99% accuracy. This enabled researchers to identify on average 25.000 coding genes and create a phylogeny tree that matches previous results. Topology shows that lifespan changes are caused by convergent evolutionary steps or selection pressure from the ancestral branch.

To get a deeper understanding of lifespan altering factors researchers searched for them with 3 specific guidelines. Firstly, they found 16 genes with positive selection pressure in the DNA repair and maintenance pathways. Of the 91 convergently positively selected genes, 56 were statistically linked to longevity, independent of factors like size and depth. Finally, observed multiple genes acting in favor of longevity with gene copy number multiplication. Researchers also analyzed genetic diversity and its impact on life expectancy.

Effects of lifespan extension were analyzed and compared to previous data. As a result, researchers were able to conclude that longer lifespan negatively correlates with population growth and fecundity while positively correlating with maturation age and survival chance.

Overall, the research found dozens of genes with high certainty of affecting lifespan including Butyrophillin (a member of the B7 immunoglobulin family), genes coding proteins that are part of the insulin and glucose signaling pathways, DNA repair genes and many more of which some can be found across the vertebrate taxa. Their effects are positively correlated with longevity and are directly or indirectly acting on it. With this knowledge we are one step closer to understanding the intricate mechanism that underlies longevity.