

# The Genetic Origins of Hagfish Slime Gland Evolution

Kaleb Ducharme, David Plachetzki, Douglas Fudge

## Background

- Hagfish produce and release a defensive slime when exposed to threats
- The slime is expelled from slime glands where it rapidly expands and clogs gills
- This is a novel adaptation in vertebrates



## Goals

- Identify genes and pathways involved in slime gland function
- Understand Genetic Mechanisms Leading Slime Gland Evolution

## Methods



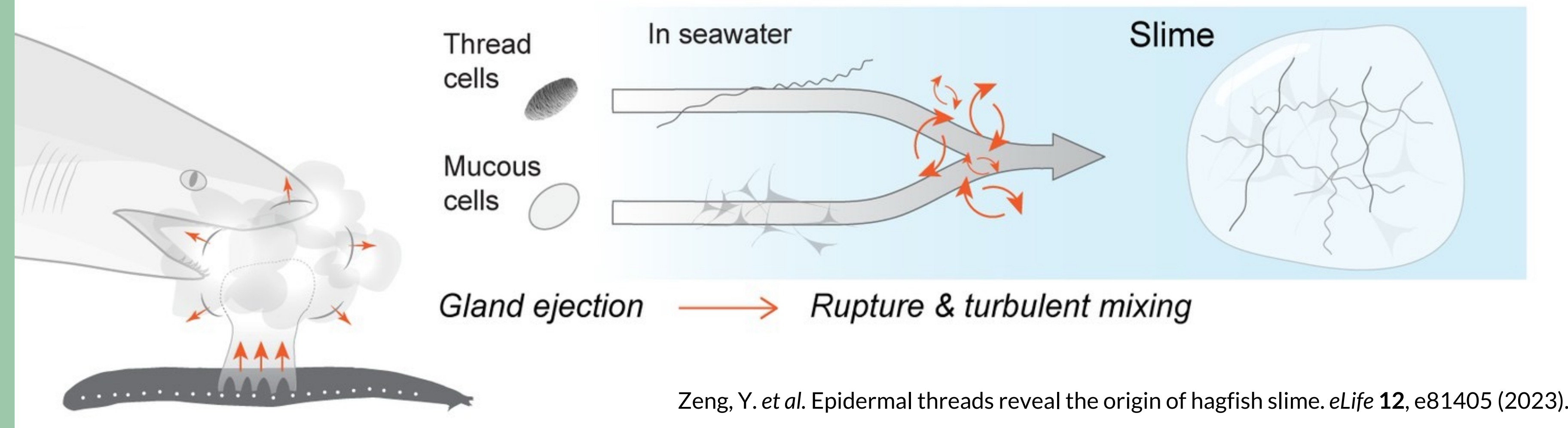
## Findings + Future

- Found important genes used in slime glands
- Single cell sequencing to determine what cell types do which function
- Coptation, duplication/divergence, and potential retroelements underly slime gland evolution

## Acknowledgements

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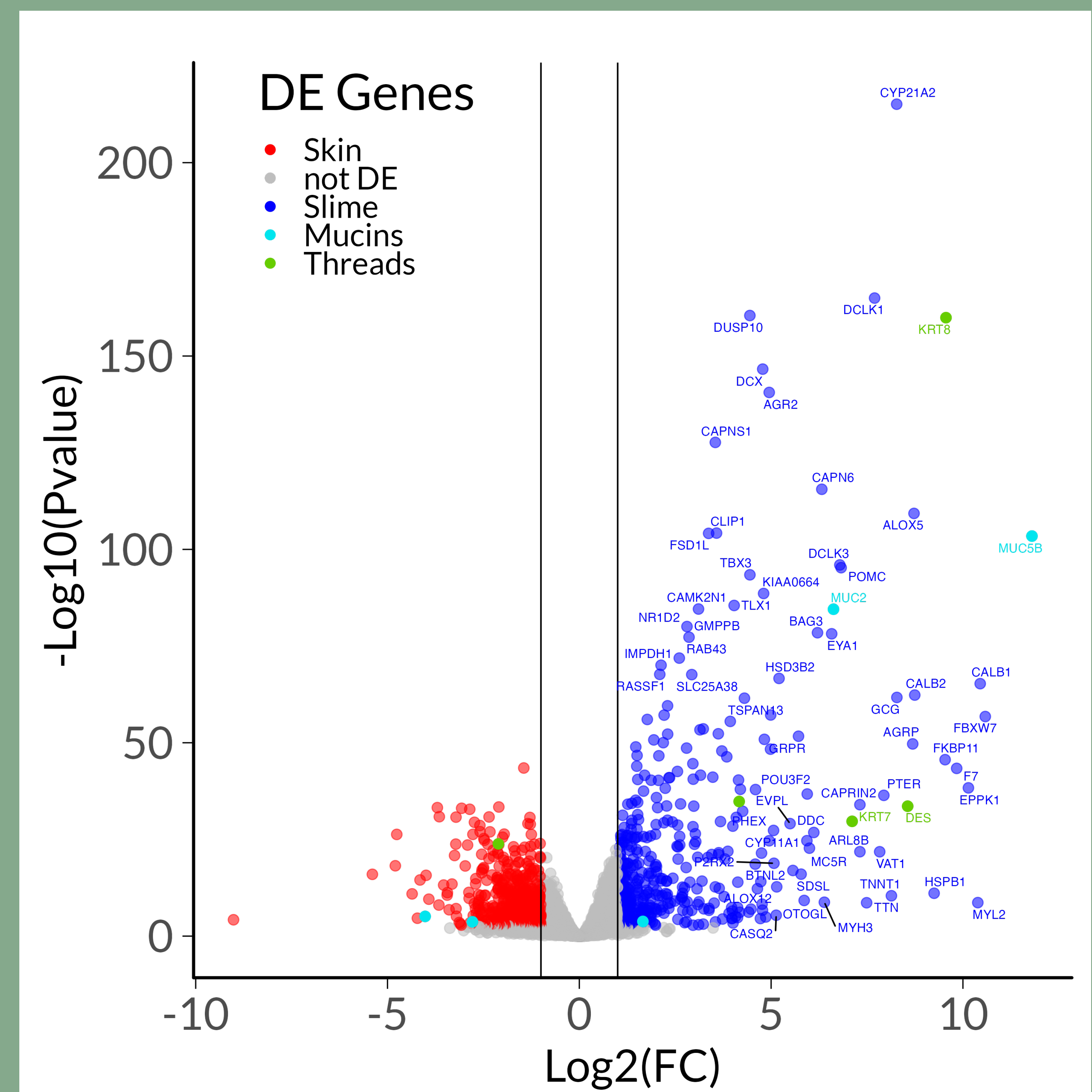
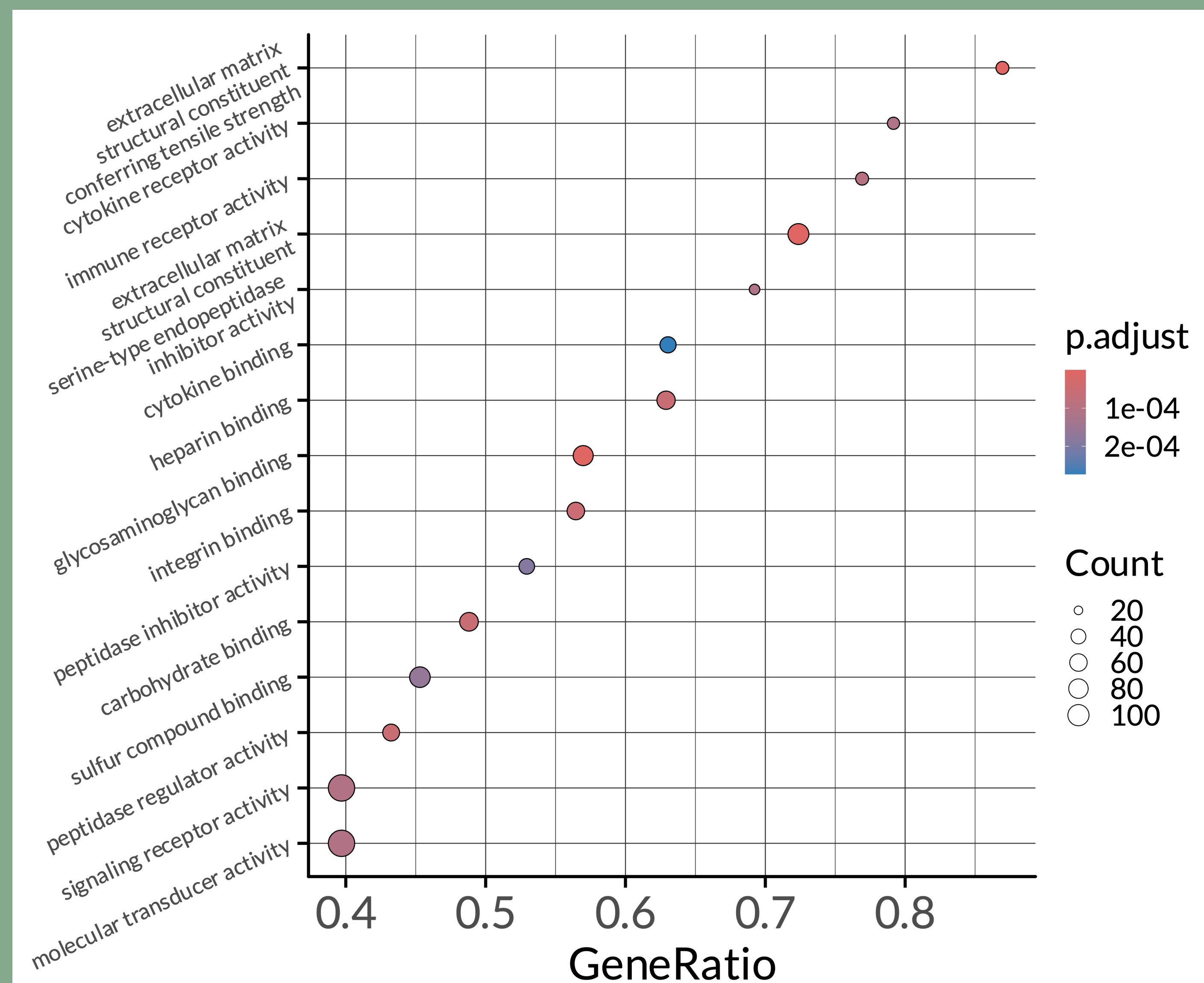
Hagfish release slime in response to being threatened. Slime glands along the epidermis produce and release thread and mucous cells that rupture upon touching seawater. The cell contents are mixed and rapidly expand to form a viscous slime.



Zeng, Y. et al. Epidermal threads reveal the origin of hagfish slime. *eLife* 12, e81405 (2023).

## Results

A volcano plot showing differentially expressed genes between skin (left, red) and slime gland (right, blue) tissues from *Myxine phantasma*. Threads are highlighted in green, and mucins are in teal. The top slime expressed genes are labeled with human equivalent gene symbols. Many genes listed are used in other tissues, which supports cooption of genes for use in slime glands



A dot plot showing the results of a Gene Set Enrichment Analysis (GSEA) of Gene Ontology (GO) Terms for Molecular Function. Most enriched terms are associated with thread genes, while others warrant further exploration on how they integrate with slime glands and their function

Expression of a thread gene cluster in the *Eptatretus atami* genome. Slime gland (blue) and skin (red) mRNA expression have different thread genes, signaling duplication and divergence. Thread genes indicated with blue arrows

