Genomic and Geographic Adaptations to Climate Change in the Wild Yak

Sathyanarayanan Venkatakrishnan (0816771)
Fenil Amitkumar Patel (0828038)

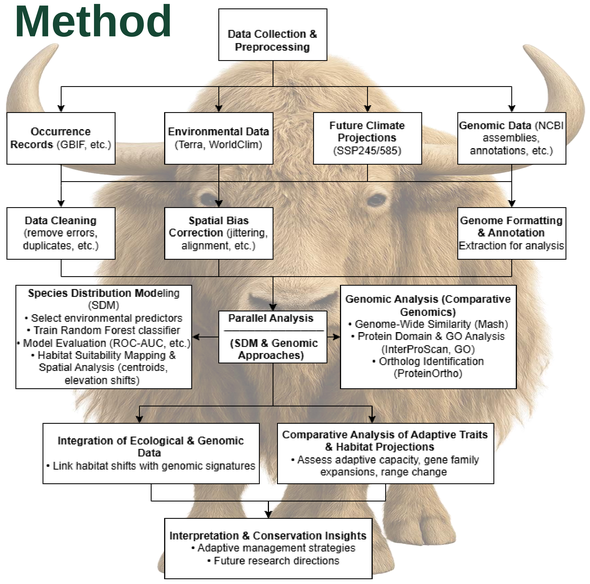
GROUP
B-12

Introduction

- Wild Yak (Bos mutus) **thrives in cold, high-altitude regions.**
- Climate change threatens its specialized mountain habitat.
- **Dense fur and low heat tolerance** may limit survival.
- We used:
  - ***SDM to model future habitat shifts.***
  - ***Genomics to assess adaptive traits.***

Goal: Understand Yak's response to climate change.

Method



Gene	Function	Why It Stands Out
KAP 9-3	Hair structural protein	Enables thick wool for cold resistance
GSS	Glutathione synthesis	Protects from oxidative UV/hypoxia stress
IFNW1 (putative)	Antiviral cytokine	Supports immune defense at altitude

Results

- Significant **habitat loss projected by 2050; range shifts northwest** and upslope.~110 km centroid displacement reflects climate-driven movement.
- Genomic traits show enrichment for oxygen use, cold adaptation, and immunity.
- **Dense fur and moderate heat shock response** (HSP ~5.7–6.4) may hinder heat tolerance.
- **Limited physiological flexibility may reduce adaptability under rapid warming.**

Wild Yak faces substantial habitat loss and altitudinal displacement by 2050, driven by climate change and limited adaptive genomic traits.

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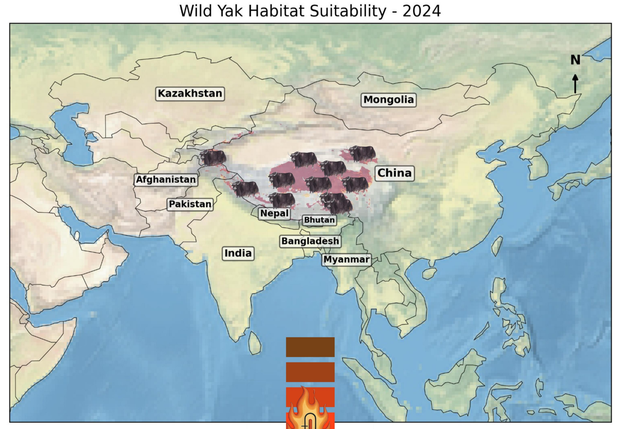
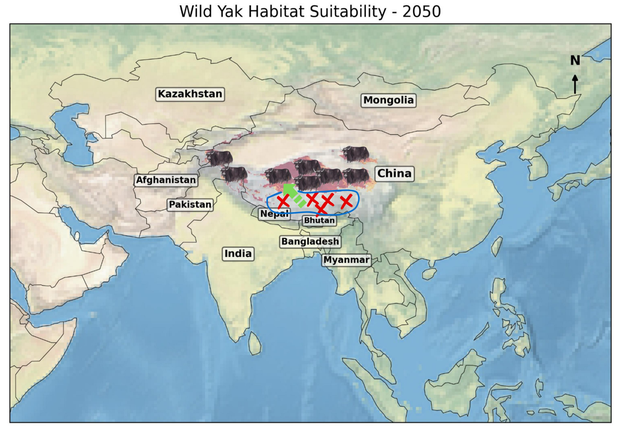
Wild Yak Habitat Suitability - 2024

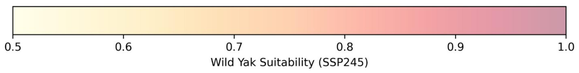


Fun fact 1: Earth is 1.2°C warmer than pre-industrial times.

Fun fact 2: Wine taste is changing due to warming!

Wild Yak Habitat Suitability - 2050





Species-wise Distribution of Functional Gene Categories