

Seasonal and thermal regulation of hormone signaling, growth and



GEM3

Genes by Environment
Modeling · Mechanisms · Mapping

reproductive success in free-living redband trout



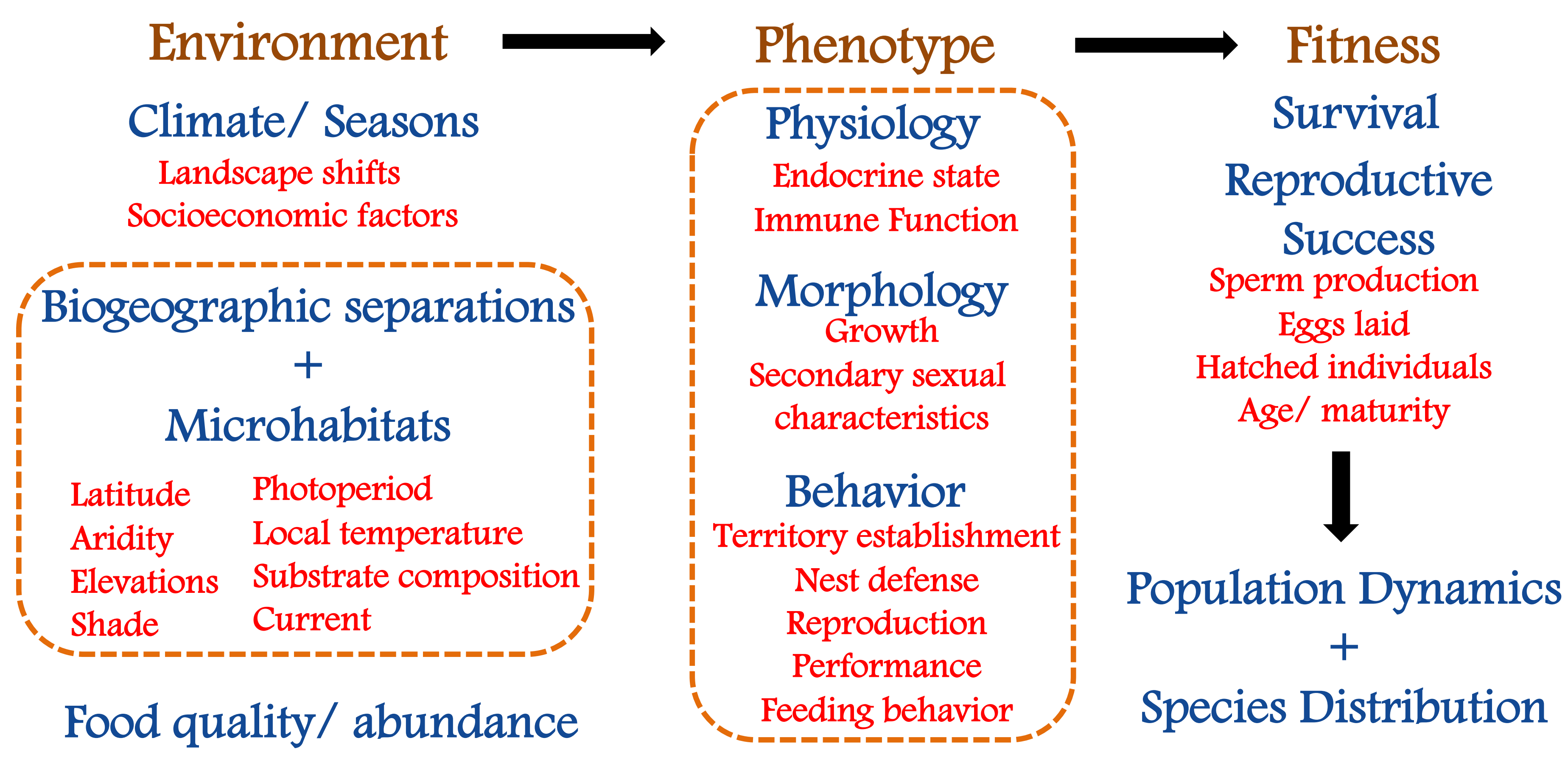
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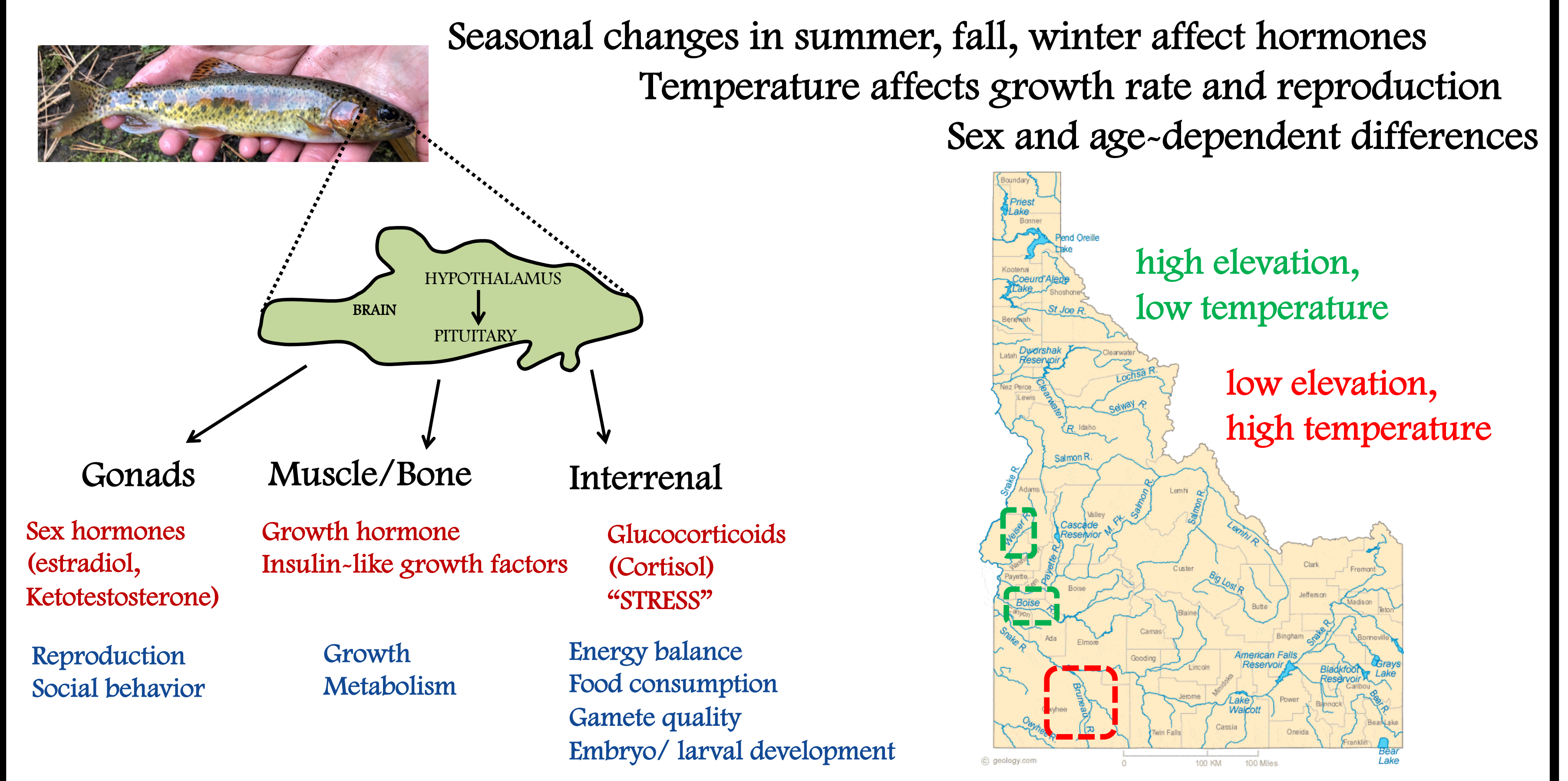
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The Big Picture: Phenotype expressed by organisms help understand resilience to environmental change



Redband trout living in warmer areas might face greater thermal stress that limits growth and reproduction

Do redband trout living in warmer areas have high thermal tolerance/stress responses?



How do shifts in seasonality and temperature affect hormones to regulate growth and reproduction?

OBJECTIVE #1

To determine the effects of shifts in seasonality and temperature on chronic stress response and growth of redband trout.

Experiment 1.1: Do trout populations from low elevation and high temperatures experience chronic thermal stress?

METHODS: We will measure differences in cortisol levels in plasma of males, females, and juveniles.

PREDICTION: individuals collected from high temperature sites will have a higher stress response indicated by higher levels of plasma cortisol.

Experiment 1.2: Does thermal stress reduce growth?

METHODS: We will conduct morphological measurements, levels of growth hormone, and and IGF-1 in plasma of trout.

PREDICTION: individuals collected from high temperature sites will have a lower levels of growth and associated hormones.

Experiment 1.3: Do nutritional states and feeding behavior affect growth?

METHODS: Prior to collecting fish samples, we will measure feeding behavior and substrate composition. Then measure metabolic parameters: triglycerides, blood glucose levels.

PREDICTION: interaction of cortisol, metabolism, and growth

OBJECTIVE #2

To determine the effect of thermal stress on steroid hormone and reproductive success (RS) of redband trout.

Experiment 2.1: Does thermal stress affect reproductive behavior and reproductive success?

METHODS: We will measure behavior such as courtship, spawning, redd preparing, and nest defense. Photographs of eggs will be taken to determine RS.

PREDICTION: expression of reproductive behavior and reproductive success will be higher in fish from higher elevation and colder temperatures. However, it is possible that there is no difference in behavior and reproductive success between these habitats, because individuals can cope with the thermal stress. Alternatively, these fish may also shift their optimal breeding temperature with thermal stress.

Experiment 2.2: Does thermal stress affect hormone levels during breeding season?

METHODS: We will measure plasma levels of ketotestosterone, estradiol, cortisol and vitellogenin.

PREDICTION: cortisol levels will be elevated in fish collected from warmer areas and this might be adaptive and help fish cope with thermal stress. The levels of sex hormones and vitellogenin may be lower in organisms that experience thermal stress.