

Life history differences across a latitudinal gradient in side-blotched lizards (*Uta stansburiana*)



GD Smith, A Berryman*, PA Zani, and SS French
Utah State University Department of Biology

Introduction

Latitudinal variation has long been known to affect life history

Bergmann and Allen made latitudinal “rules” for mammalian anatomy and Lack, Skutch, and Moreau described differences in life history in birds

Trade-offs occur between important life history processes, like self-maintenance (immunity) and other expensive but necessary processes

It is likely that trade-offs occur mostly when resources are limited

Side-blotched lizards have a wide geographic range, and more northerly lizards have been observed to have longer lifespans than their southern conspecifics

We hypothesized that northern side-blotched lizards would invest more energy into self-maintenance compared to shorter-lived southern animals

Methods

Southern female lizards from Utah (n=31) and northern lizards from Oregon (n=22) were collected and housed under identical laboratory condition

Lizards were randomly assigned to *ad libitum* (3 crickets every day) and restricted (3 crickets every 3 days) treatments. Food intake was quantified, and animals were weighed at the beginning and end of the study

All lizards received a uniform immune challenge (cutaneous biopsy) on Day 7 which was photographed upon administration and again at the end of the study to assess healing rates

Blood samples were taken at the end of the study for hormonal assays (via radioimmunoassay) and microbiocidal assays

Results

Legend for all figures
restricted Ad libitum

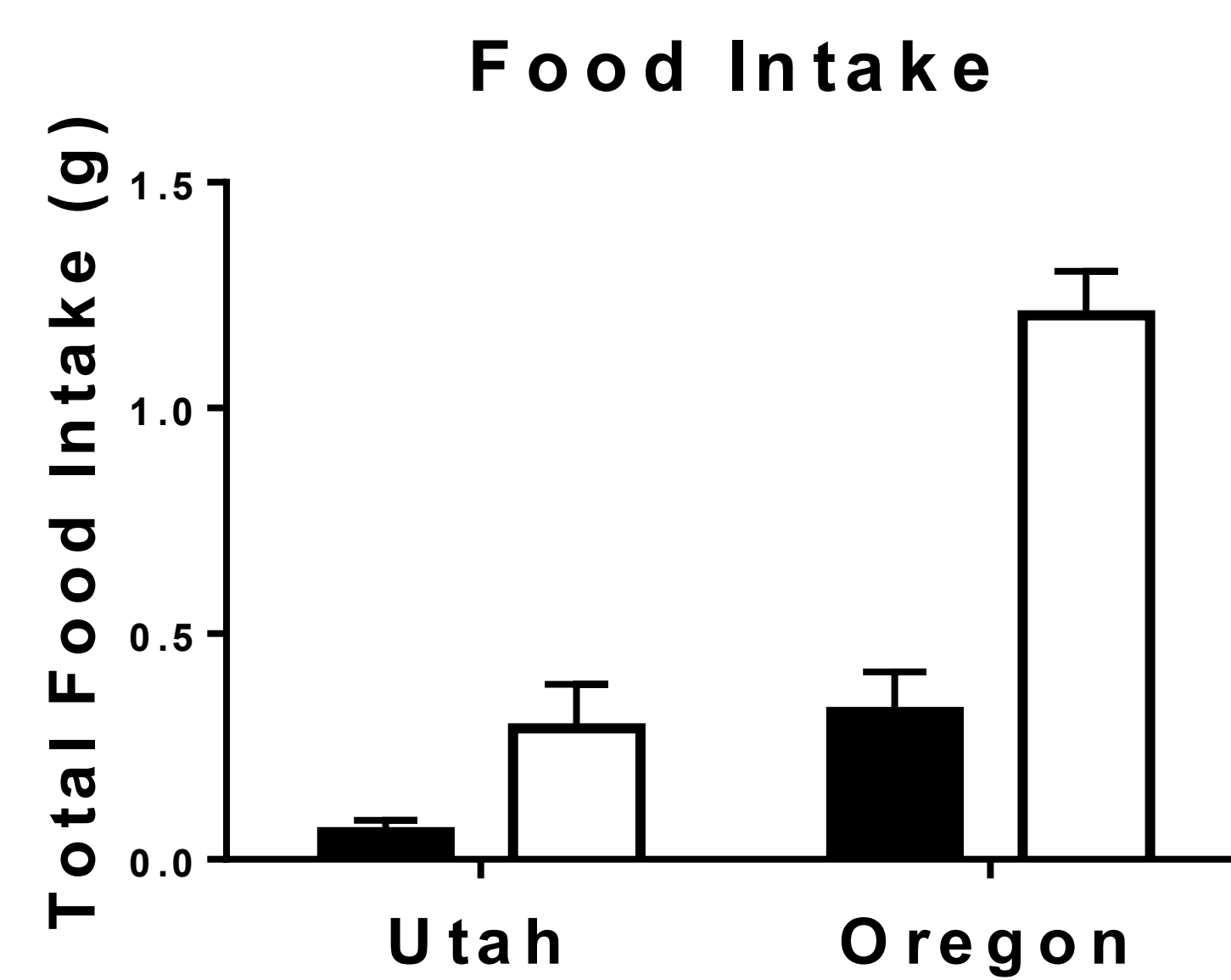


Figure 1. Northern animals ate significantly more than southern ones ($F=24.735$, $p<0.0001$). There was a significant effect of feeding regime ($F=8.279$, $p=0.007$), but no interaction ($F=2.748$, $p=0.106$).

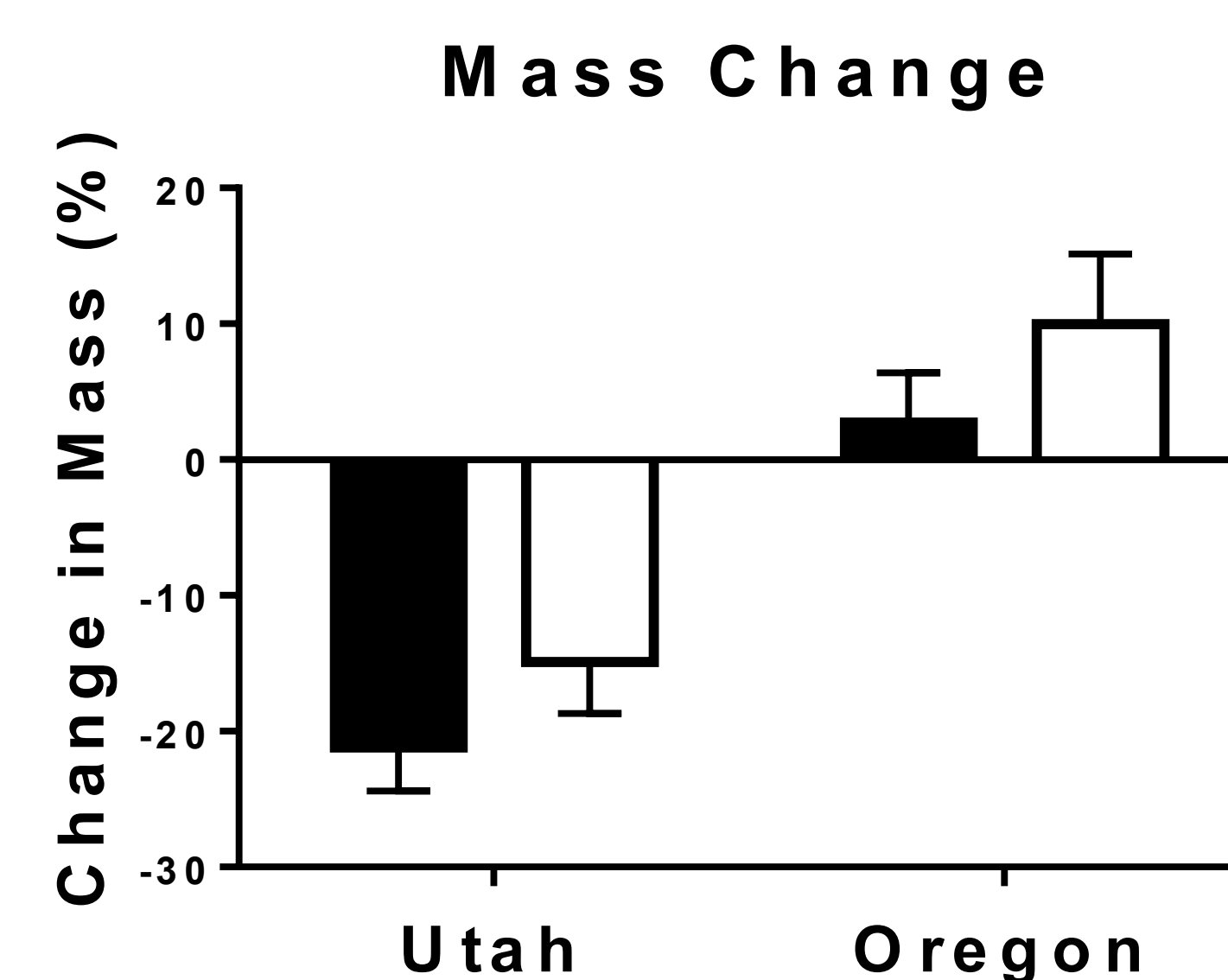


Figure 2. Northern animals gained significantly more weight than southern ones ($F=37.845$, $p<0.0001$) and there was no significant treatment effect or interaction.

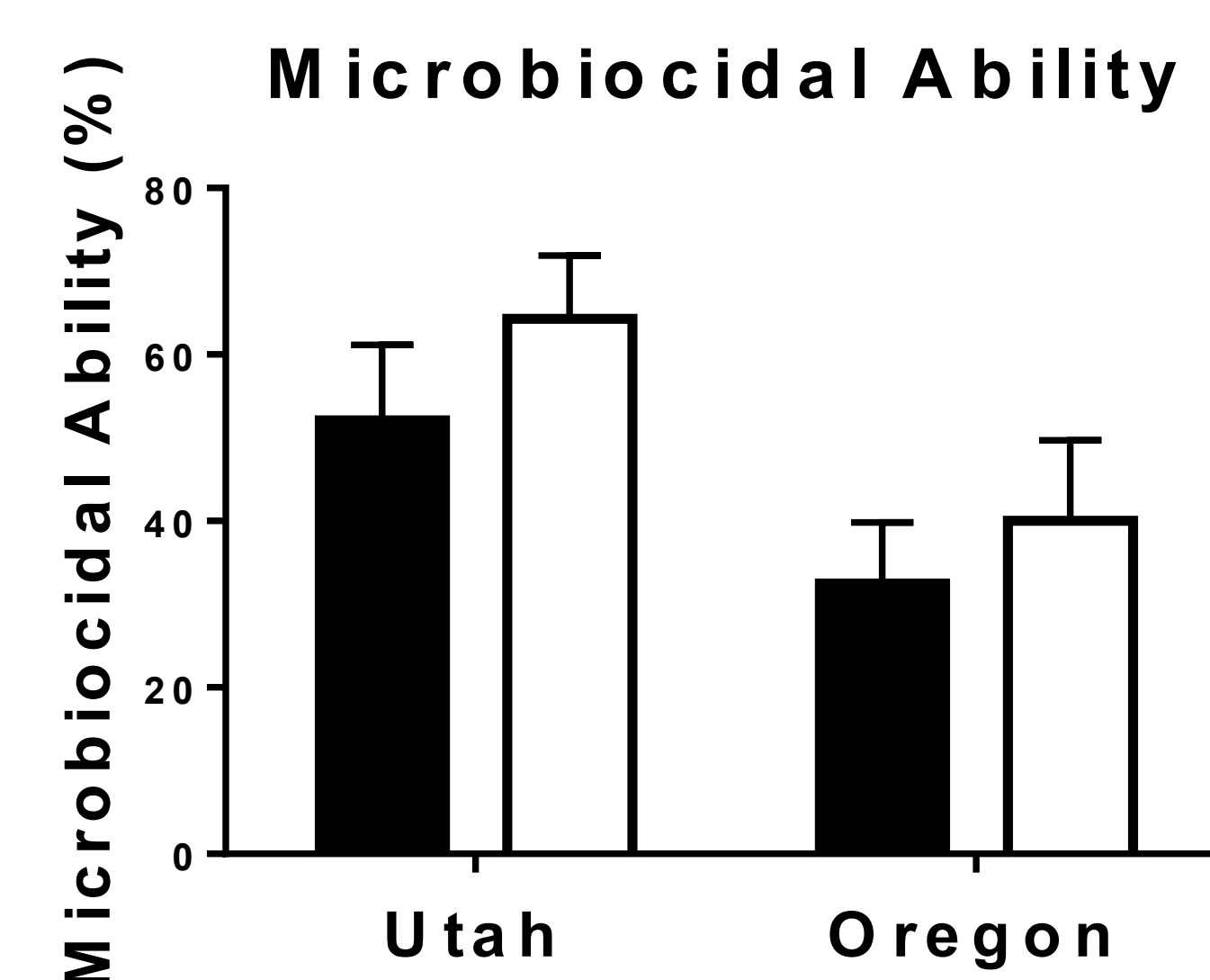


Figure 3. Southern animals had significantly stronger microbiocidal abilities than northern ones ($F=6.448$, $p=0.015$). There was no significant treatment effect or interaction.

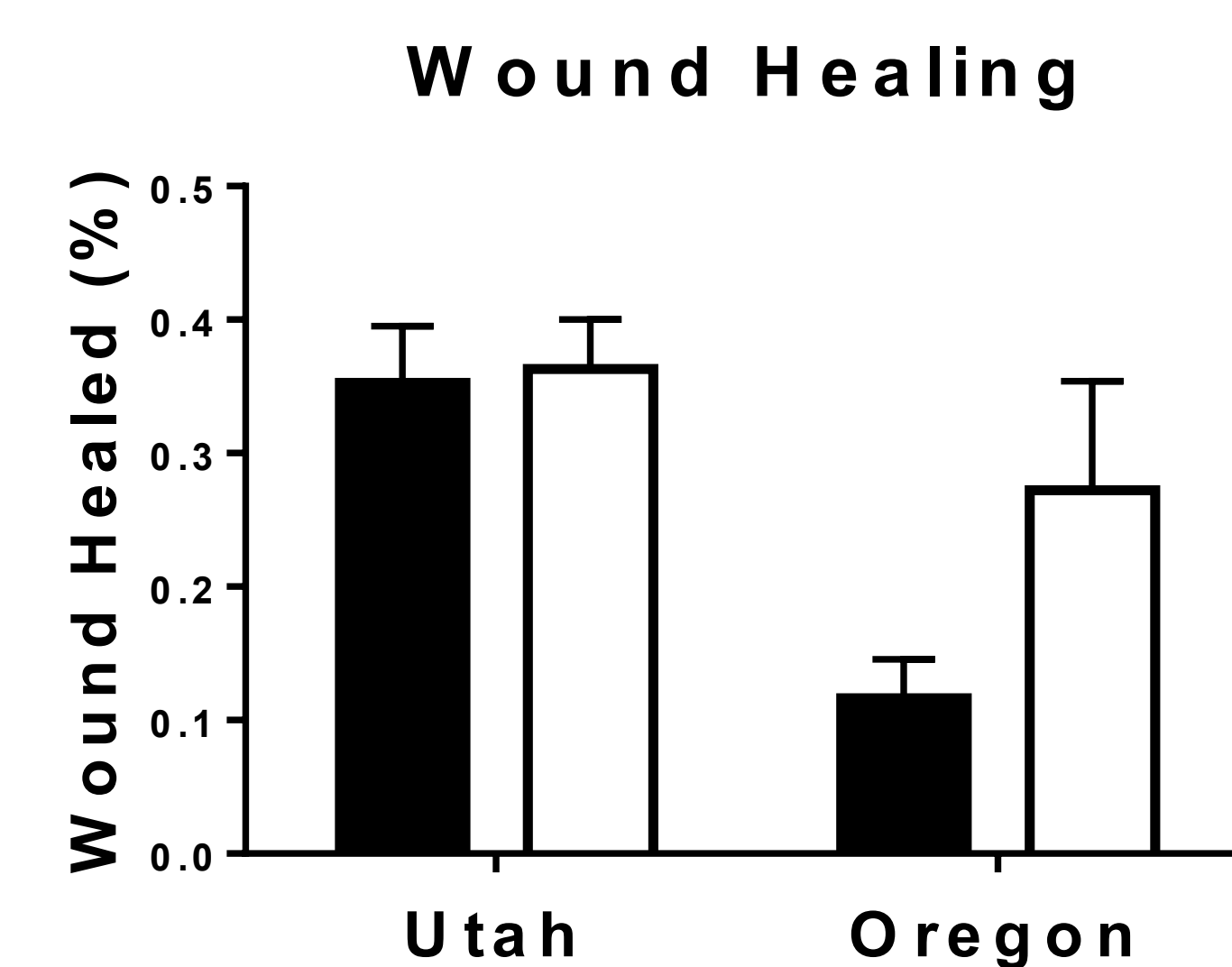


Figure 4. Southern animals had significantly faster rates of wound healing than northern ones ($F=10.901$, $p=0.002$). There was no significant treatment effect or interaction.

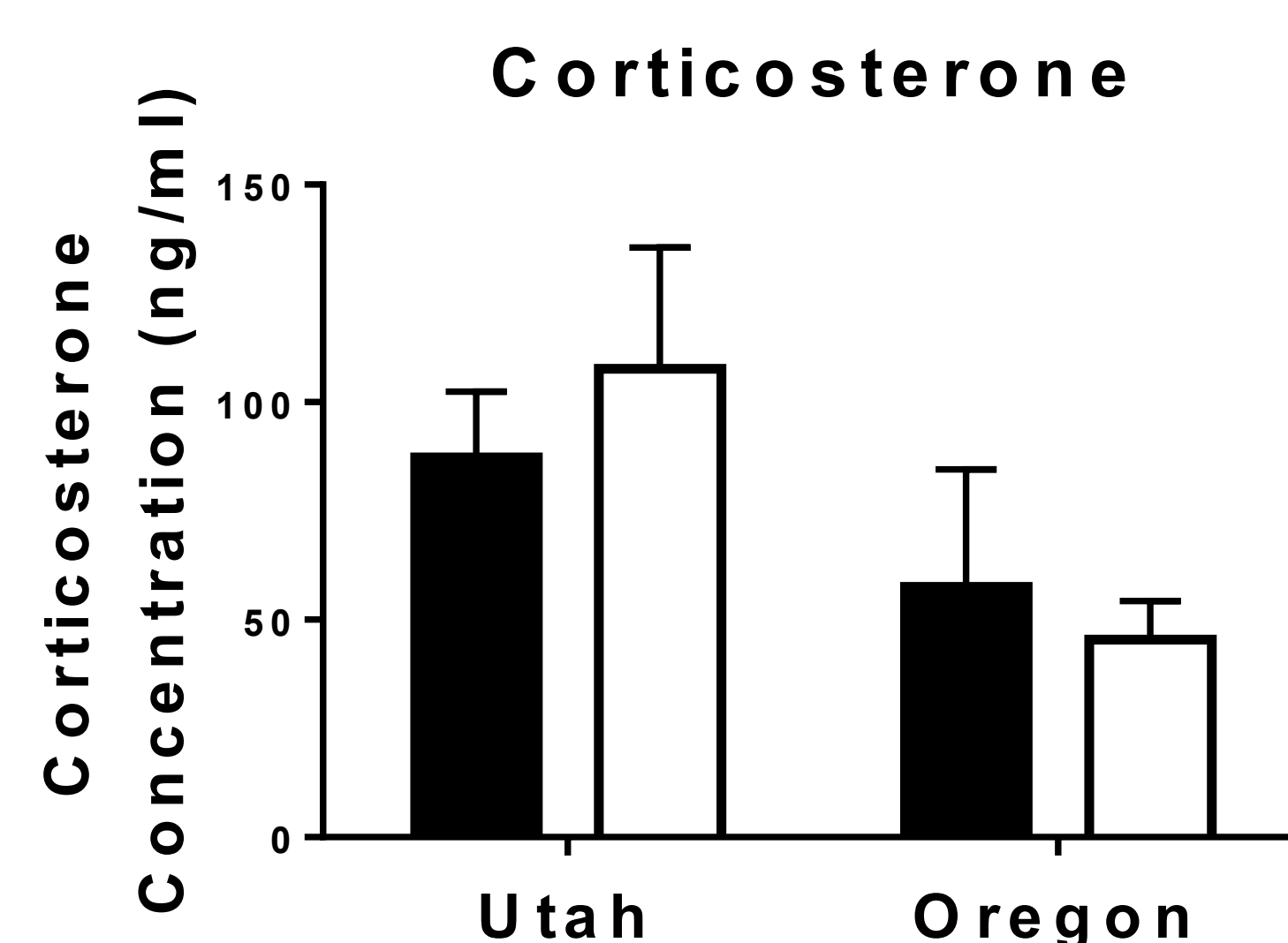


Figure 5. Southern animals had significantly higher circulating corticosterone concentrations than northern ones ($F=6.246$, $p=0.017$). There was no significant treatment effect or interaction.



Discussion

The results of this study suggest that *Uta* do not follow the same latitudinal life-history or ‘pace of life’ patterns as mammals or birds. This more plastic approach has been suggested in other reptile species as well.

Northern animals ate more food and maintained body mass, whereas southern animals lost body mass. It is possible that harsher winters contribute to greater resource fluctuations and northern animals take advantage of food when it is available.

Southern animals displayed greater microbiocidal ability and greater wound healing, which rejected our hypothesis. Southern animals seem to be investing more energy into self-maintenance than northern animals, even though they took in less food.

Southern animals also exhibited higher concentrations of corticosterone, an energy-mobilizing hormone known to be involved in the immune response. The stress response might be different among these different populations, and this might contribute to differences in immunity and feeding behavior, which can also be stress-sensitive.

There were no differences in clutch number or the average, maximum, or sum follicular lengths (measured via ultrasound), but a larger percentage of Oregon animals laid eggs throughout this study (31.82% compared to 25.81%), while managing to maintain weight compared to southern animals.

