Where, When and Why Steller sea lions experience physiological stress

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- Physiological stress in Steller sea lions
 - 1) WHERE? Geographic distribution Rookeries vs. haulouts
 - 2) WHEN?

Summer 2000 → Winter 00-01 → Summer 2001 Consequences – stress *vs.* reproduction

3) WHY? Causes

Vertebrates respond to food shortages by increasing secretion of stress hormones

- facilitates foraging behavior
- allows mobilization of stored energy resources
- Chronic elevation of stress hormones is <u>detrimental to reproduction and survival</u>
- Stress hormones can be measured in blood and scat

Secretion of stress hormones increases in response to nutritional deficits



Captive birds kittiwakes



Secretion of stress hormones tracks changes in food abundance



 $R^2 = .51$





Free-living birds Common murres

Stress hormones are negatively correlated with endogenous fat reserves





WHERE Sea Lions experience stress?

Sea lion rookeries (scat samples from breeding females) and haulout (scat samples from non-breeding animals) sampled during late June 2000

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	Adugak	Atkins
and the second s	Pinna	Whaleback acle
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Geographic pattern

Is reproduction stressful?



Rookery and haulout sampled during late June 2000

Is reproduction <u>always</u> stressful?



Rookery and haulout sampled during late June 2000, and rookery sampled during late June 2001 • Physiological stress in Steller sea lions

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Sea lion Rookeries sampled in the Western Aleutians during summer 2000 winter 2000-2001 summer 2001

<u>WHEN?</u> Inter-annual change



Sea lion Rookeries sampled during summer 2000 summer 2001

Consequences

vs. pregnancy

hormones

stress



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3) WHY? Causes

Is it food?

Stress vs. Diet quality



<u>Is current physiological stress related to factors that</u> <u>determined population decline during 1976-2000?</u>



-SE SE Akutan Billings Head Bogoslot Adugak

Yúnaska

^{ak} Pinnacle

Prediction: If factor(s) that determined decline of sea lions during 1976-2000 are still at play, then a negative relation is expected between stress hormones and a rate of population decline





Is current physiological stress related to factors that have determined population decline during 1976-2000?



Summary

- Physiological stress is contributing to the decline of the western stock
- Negative effect of stress on reproductive function is evident
- Limited support for the nutritional stress hypothesis

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