

# Thyroid hormones and plasma leptin concentrations during food deprivation and satiety use as an index of metabolic condition in free-ranging Steller sea lions



*Project Synopsis*  
**00-01**

*Research Theme*  
**Protected Species**



A female Steller sea lion and its pup.

Credit: Lorrie Rea, ADFG, under MMPA permit 358-1888

## Looking for the signs of stress

*Species in decline or struggling to recover from a decline are often under stress. Gaining a better understanding of the physiological signs of stress may offer clues to the health of Alaska's threatened and endangered Steller sea lions.*

## WHY IS THE PCCRC INTERESTED?

Industry members are interested in aiding the recovery of Steller sea lion populations. This research has the potential to offer a new tool that scientists and managers can use to gauge the health of this important marine mammal and monitor its recovery.

## WHAT SCIENTISTS DID

Scientists assessed the usefulness of a suite of hormones associated with stress and metabolism to evaluate the body condition and overall health of Steller sea lions. Researchers collected 460 blood samples from juvenile sea lions, and measured a set of thyroid hormones (called total and free T3 and T4), the stress-regulating hormone cortisol, and the energy-regulating hormone leptin.



Researchers collect physiological data from a Steller sea lion.  
Credit: Lorrie Rea, ADFG, under MMPA permit 358-1888

## Funding Summary

### PRINCIPLE

#### INVESTIGATOR

**Shannon Atkinson**

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### GRADUATE STUDENTS

**Matt Myers**

Doctoral Degree

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### COLLABORATORS

**Lorrie Rea**

Alaska Department of Fish and

Game

**Kendall Mashburn**

University of Alaska Fairbanks

### YEAR FUNDED

2000

### RESEARCH PERIOD

2000-2003

### BUDGET

\$51,388

## OBJECTIVES

Investigate the suitability of analyzing Steller sea lion blood samples for leptin and other hormone concentrations as an indicator of fitness in free-ranging Steller sea lions.

## BOTTOM LINE

Preliminary results indicate that thyroid hormones and leptin may be a useful indicator of Steller sea lion body size and condition.

### WHAT SCIENTISTS LEARNED

Most of the thyroid hormones (tT4, tT3, and fT3) were highest in the first year of life, and decreased to relatively level concentrations by age three. Cortisol followed the same pattern. Leptin varied by season with concentrations highest in the winter and spring. When individual hormones were plotted against body mass, a significant increase in tT3 and leptin occurred at around 100-150 kg body mass. Sea lions in this weight class tended to be around 18 months old. The increase in tT3 indicates an elevation in metabolic rate of these animals. This finding could be due to weaning, molt, or the inability of the animal to regulate its internal temperature.



Steller sea lions, some with brands applied by scientists to help monitor individual animals from year to year.  
Credit: Lorrie Rea, ADFG, under MMPA permit 358-1888

### WHAT'S NEXT

The physiology of juvenile Steller sea lions needs additional study to understand the impact of environmental change on metabolic homeostasis in young, developing sea lions.



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