

# Making Our Mark:

Assessment of behavioral and physiological effects of long-term tracking methods in Steller sea lions



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# PCCRC Research Priority #1

Factors influencing the sustainability of  
marine mammal populations

# OUTLINE

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- marking methods
- project objectives
- study design
- results
- future directions

# MARKING TECHNIQUES

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- Visual tags
  - flipper, ear, dorsal fin tags
- Hot-iron branding
- External devices
  - VHF, satellite transmitters
- Internal devices
  - Life History Transmitter (LHX)

# MARKING EFFECTS

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- injury / disease
- growth
- reproduction
- survival
  
- behavior
- physiology

# OBJECTIVES

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- Identify key behavioral responses
  - LHX surgery
  - Hot-iron branding
- Physiological indicators of inflammation
- Develop objective pain assessment methods

# TRANSIENT JUVENILE PROJECT

Prior PCCRC support 'Capture and holding of Transient Juvenile Steller sea lions' Atkinson, Castellini & Mellish (2001)



# EXPERIMENTS

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- Experiment 1 (LHX)
  - behavioral and physiological responses
  - Aug 2007 - May 2008, n = 9
  - manuscript completed Jan 2009 - Applied Animal Behaviour Science
- Experiment 2 (hot-branding)
  - behavioral responses
  - Aug 2007 - Nov 2008, n = 11
  - manuscript to be completed March 2009

# Life History Transmitters (LHX)

- archival ( $\geq 10$  yrs)
- satellite-linked
- 12 cm long x 4.2 cm diameter
- $<0.1\%$  body mass (115 g)
- abdominal incision  $\sim 10$  cm

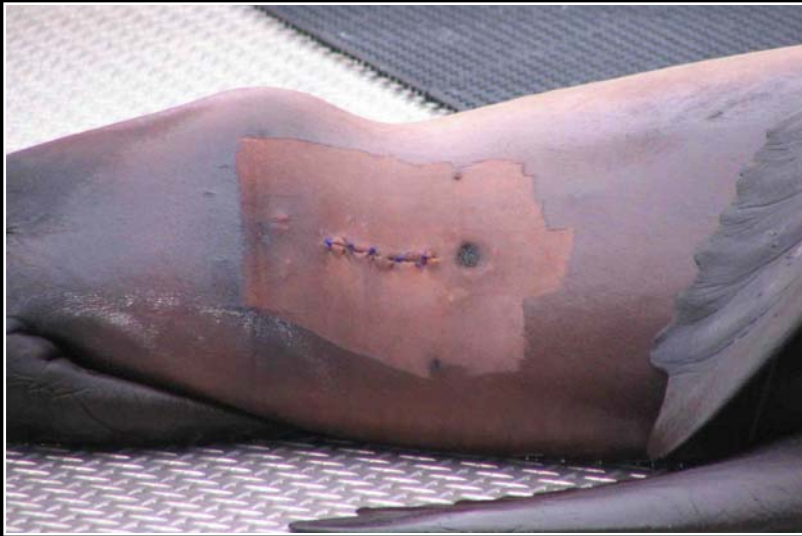


Prior PCCRC support 'Validating the use of satellite-linked mortality transmitters in rehabilitated California sea lions and juvenile

Steller sea lions' Horning (2001)

# EXPERIMENT 1: study design

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- LHX implants
  - n = 9 sea lions
  - 5 weeks after capture
  - 5 of 9 same-day branded

- gas anesthesia + systemic pain medication (n = 9)
- gas anesthesia + systemic pain medication + localized line block (n = 4 of 9)



# EXPERIMENT 1: variables

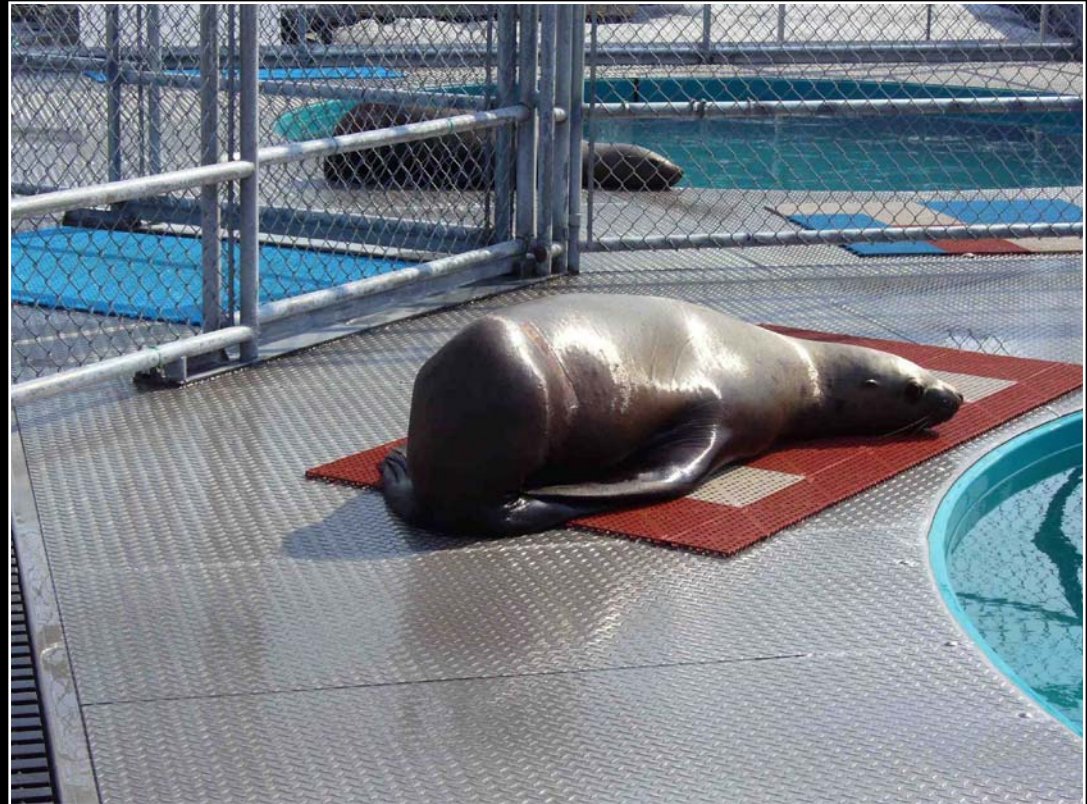
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## Behavior

- Daily observations
  - pre- and post-surgery
- 17 behaviors
  - posture and body movements, alert, grooming, time in water

## Physiology

- blood collected bi-weekly
- immune factors
  - white blood cells, platelets, albumin, globulins



# EXPERIMENT 1: behavior

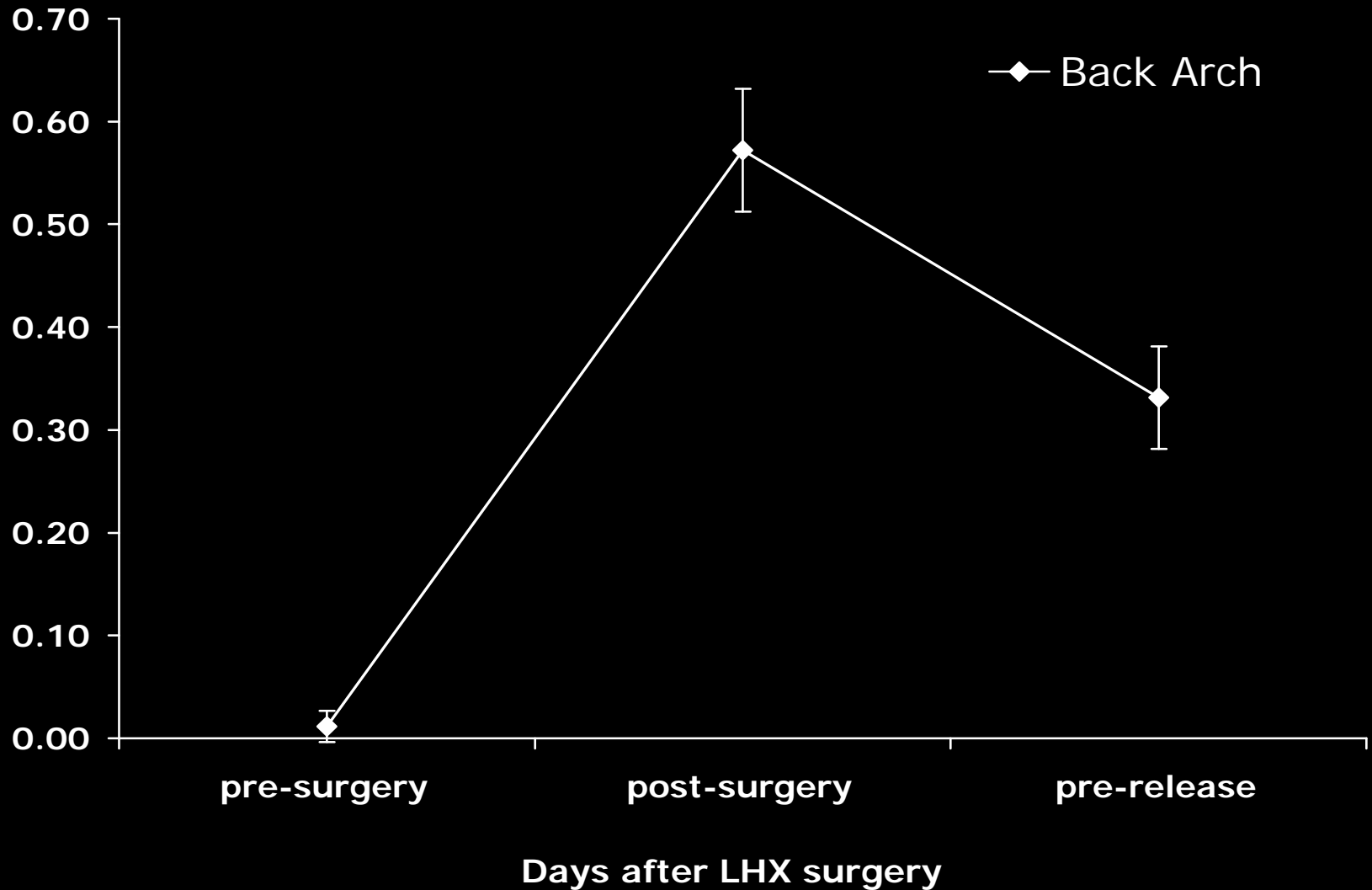
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- mixed model analysis
- 4 behaviors significant
  - ↑ standing and back arch
  - ↓ time on belly and locomotion



# EXPERIMENT 1: behavior

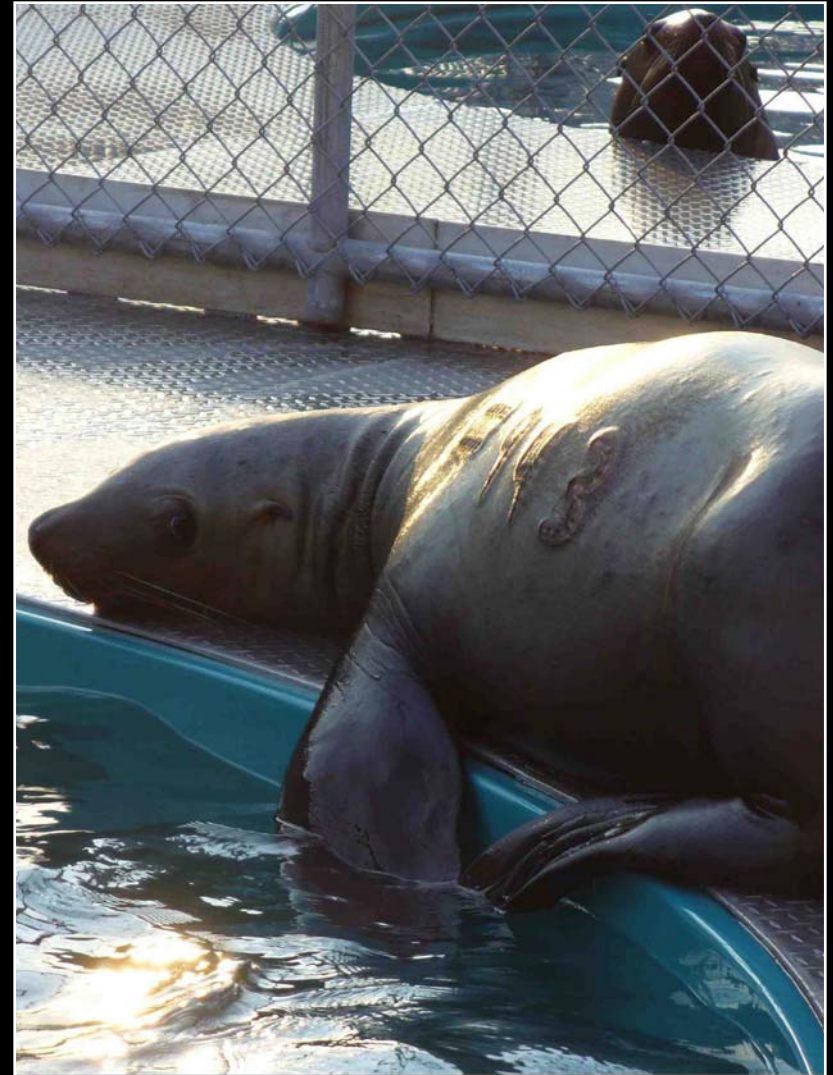
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# EXPERIMENT 1: behavior

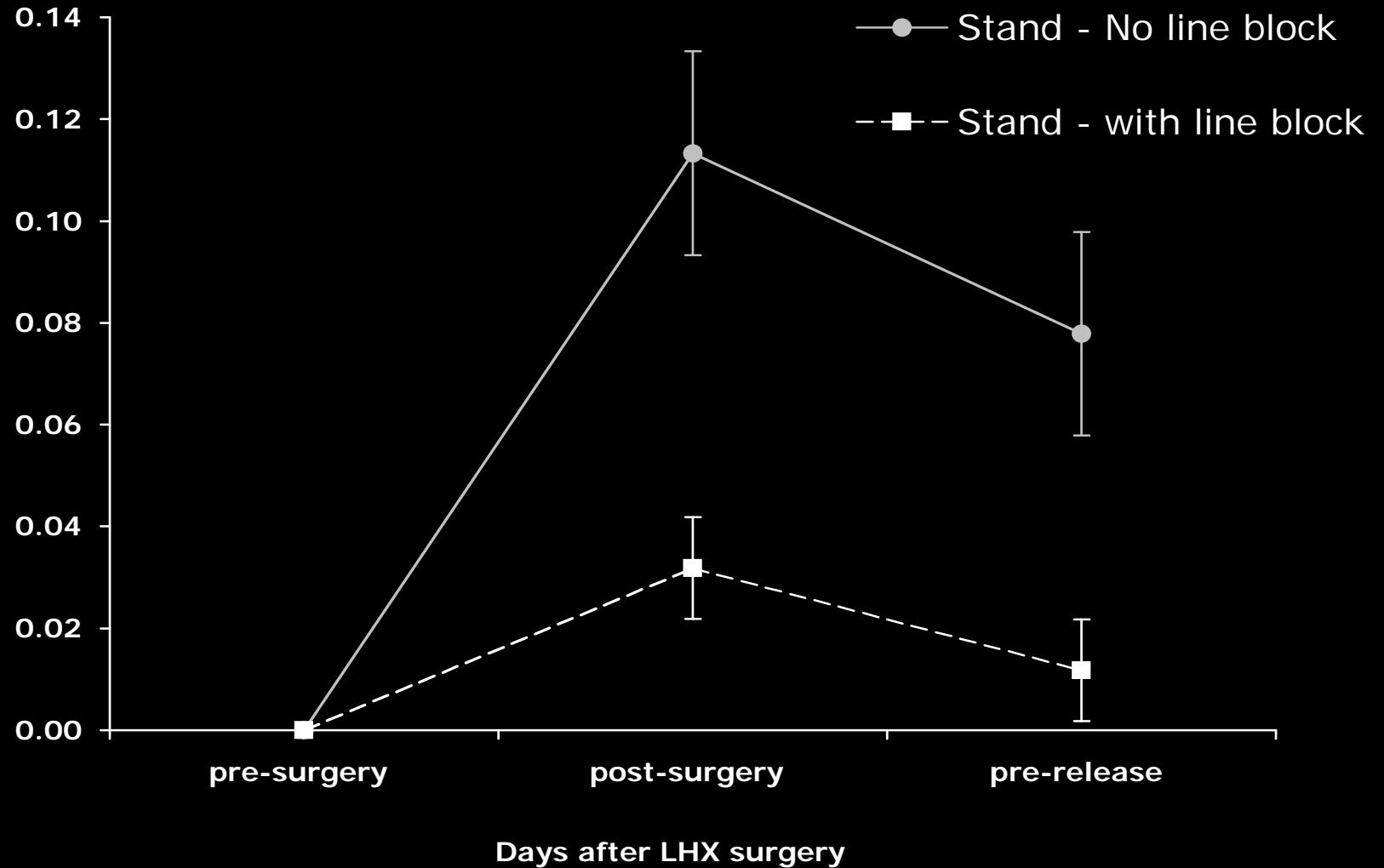
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- no effect of branding on behavior
- additional pain medication reduced pain-related behaviors



# EXPERIMENT 1: standing behavior

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# EXPERIMENT 1: physiology

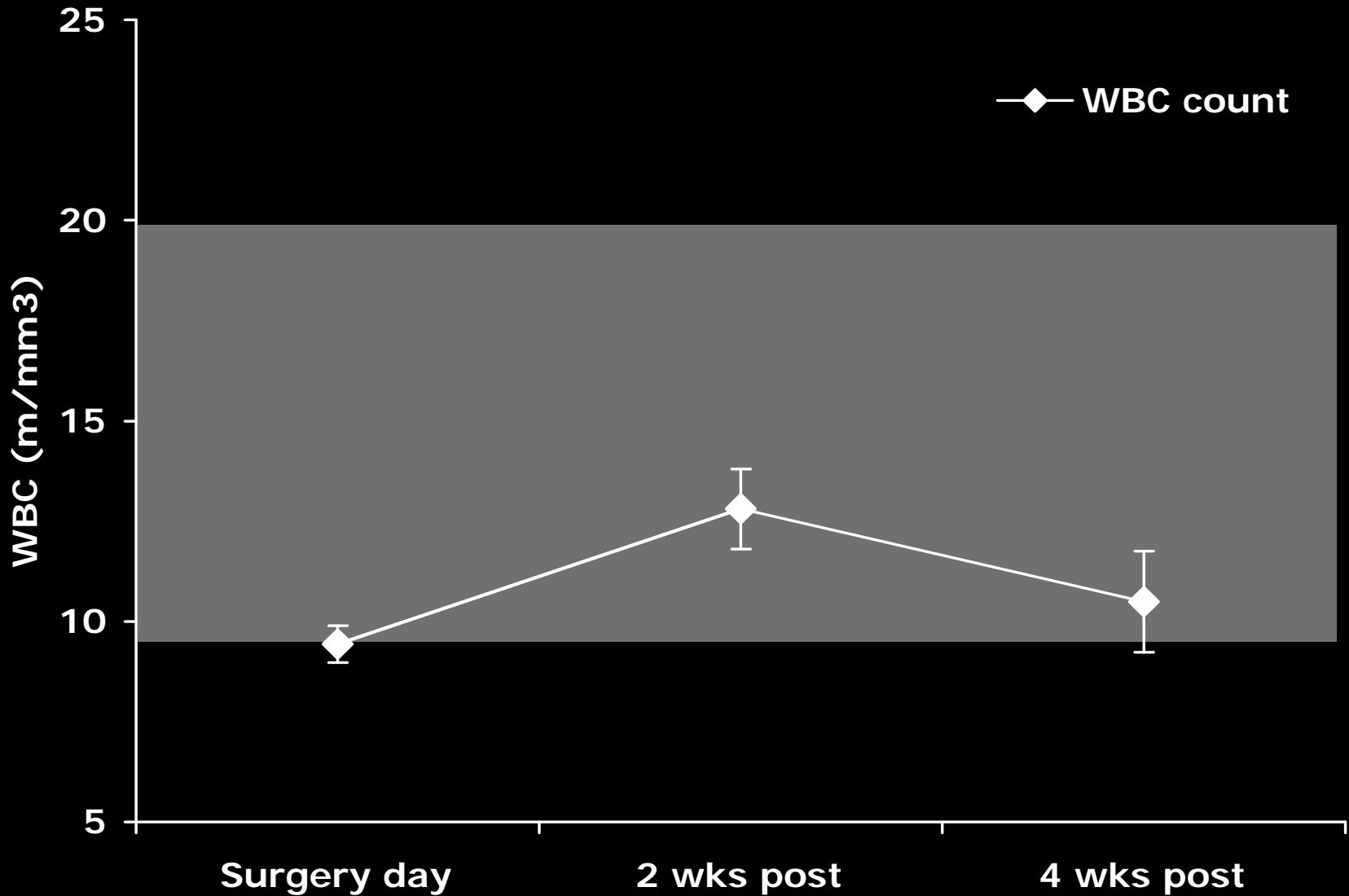
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Immune response indicators:

- ↑ white blood cells and globulins
- ↓ albumin
- no change in platelets

# EXPERIMENT 1: physiology

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# EXPERIMENT 1: summary

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- pain-related behaviors observed
- no additional effects witnessed in animals that were hot-iron branded
  - ↑ in back arch and standing
  - ↓ time on belly and locomotion
- immune response typical, within expected range
- response reduced with additional pain medication

# EXPERIMENT 2: objective

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- assess behavioral response to hot-iron branding

# EXPERIMENT 2: study design

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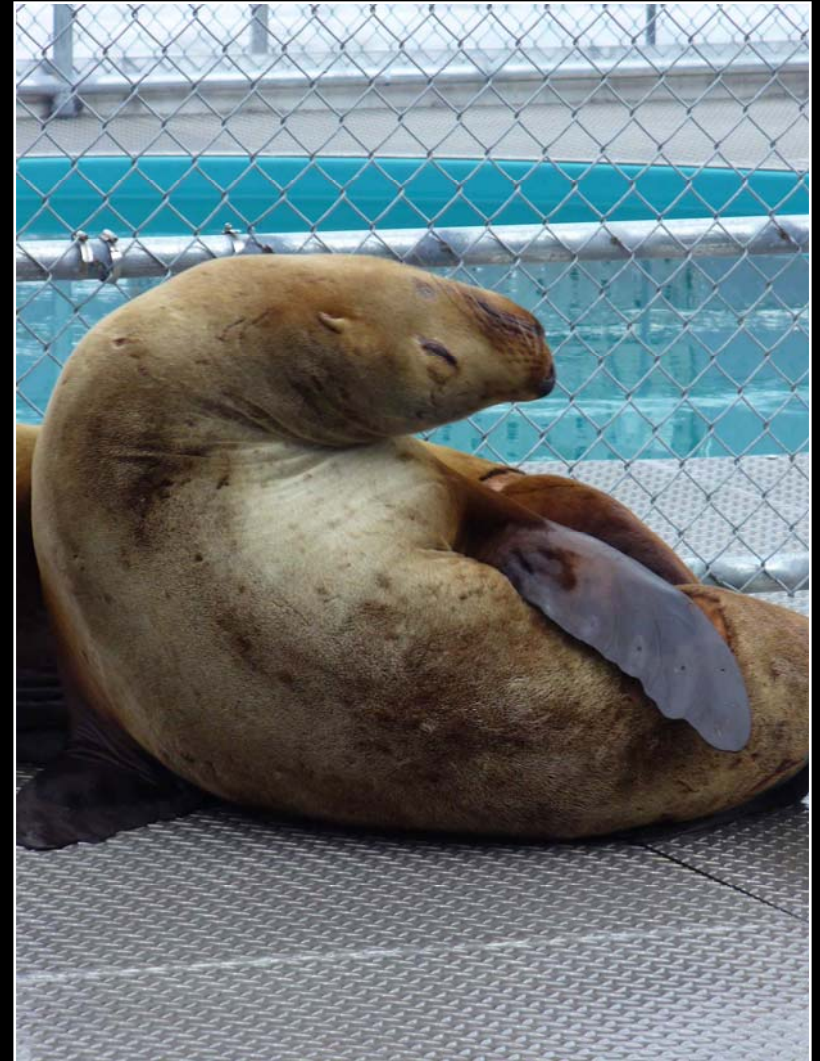
- n = 11
- 3 d pre- and 3 d post- branding
  - alert
  - in the pool
  - grooming
  - lying/sitting on left side
  - locomotion



# EXPERIMENT 2: behavior

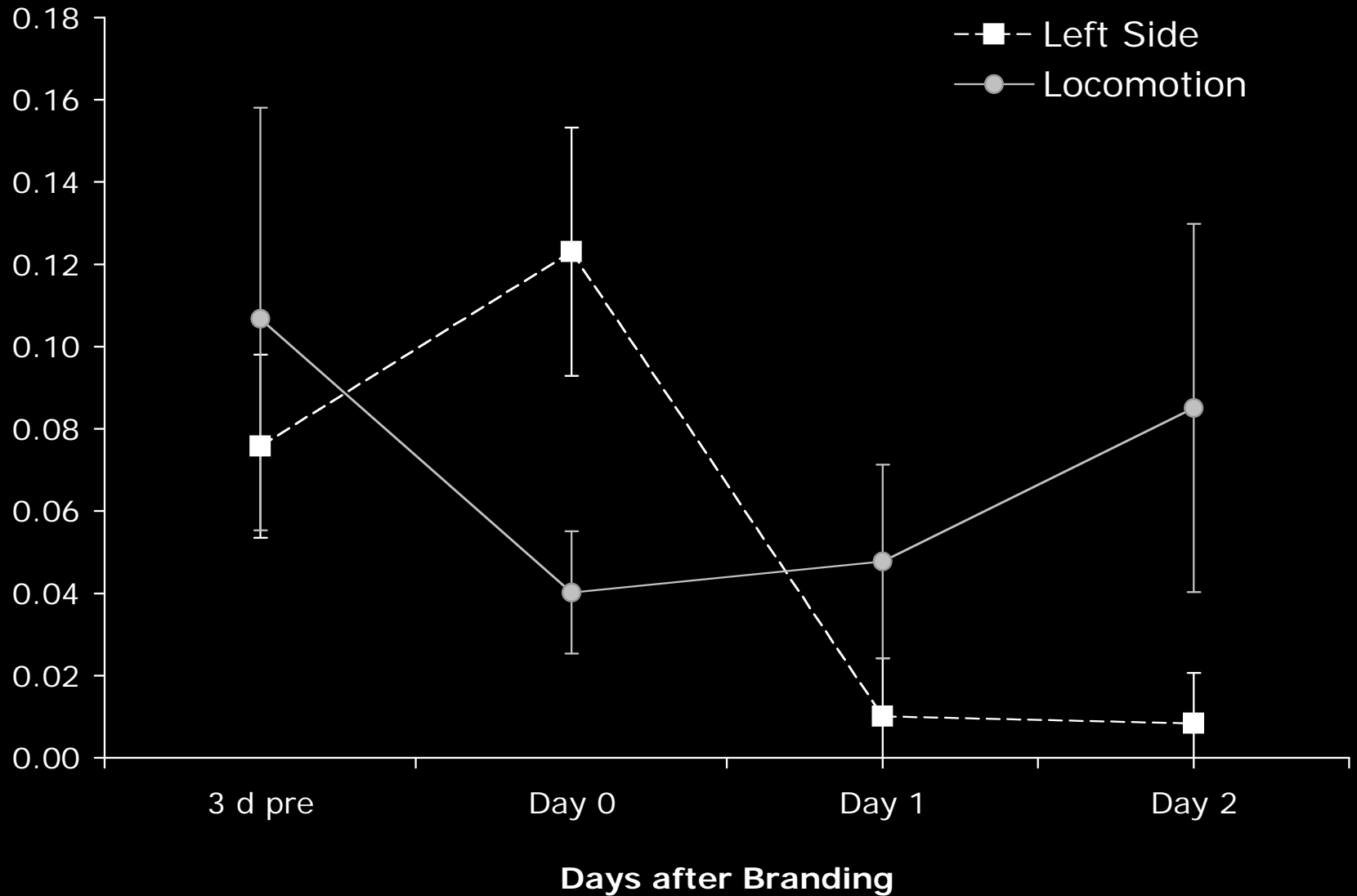
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- repeated measures ANOVA
- ↑ grooming
  - head and flipper to rub/scratch
- ↓ locomotion
- ↓ time on left side



# EXPERIMENT 2: behavior

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# PROJECT CONCLUSIONS

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## Identify key behavioral responses

- LHX
  - identified behaviors indicative of pain
  - additional medication ↓ pain behaviors
- Hot-iron branding
  - wound directed behaviors witnessed after branding

**\*\*2 manuscripts\*\***

## Physiological responses to surgery

- immune response within expected range, receded prior to release

**\*\*1 manuscript\*\***

*Expected completion of project: July 2009*

# FUTURE EXPERIMENTS

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- 1 – alternative pain medications (LHX surgery)
- 2 – short-term behavior, heart and breath rate changes (brand)
- 3 – wound healing assessment via clinical and physiological measurements including infrared imaging (brand)



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