Controlled experiments to explore the use of a multi-tissue approach to characterizing stress in wild-caught Pacific halibut (*Hippoglossus stenolepis*)

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Fish condition & survival

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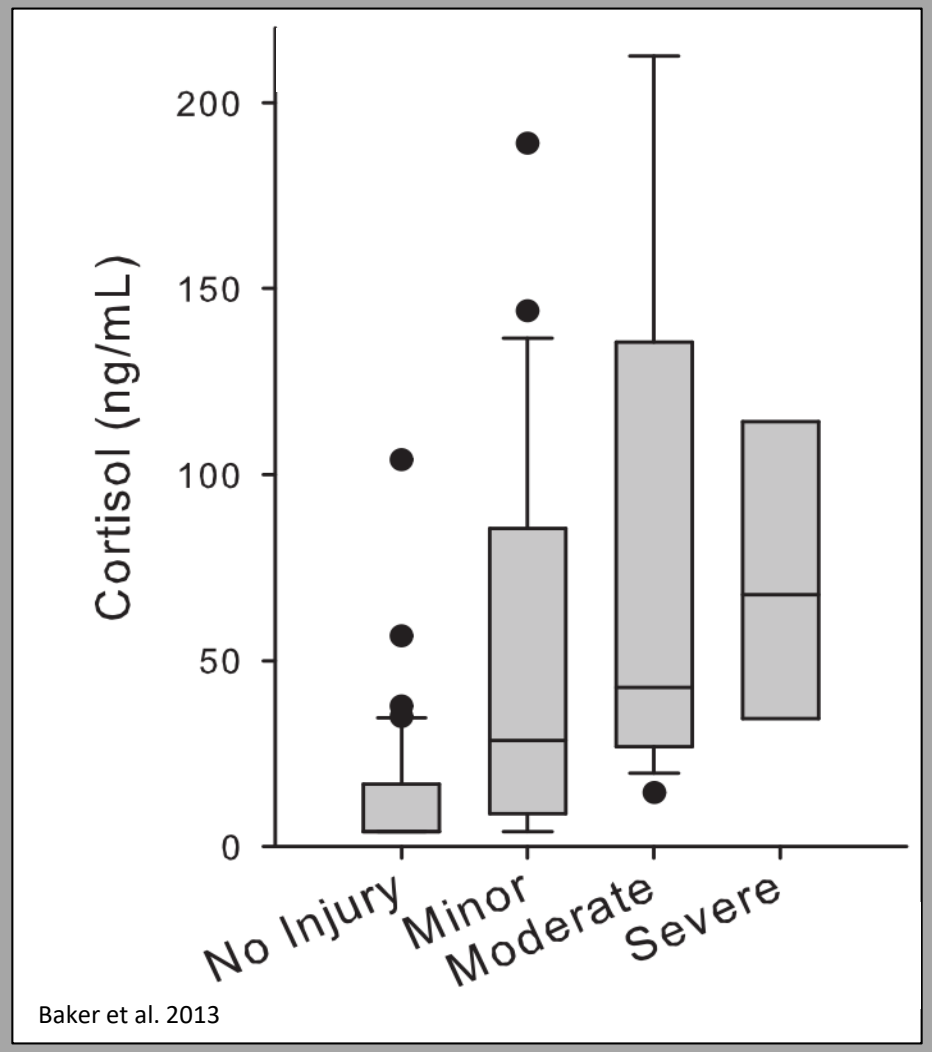
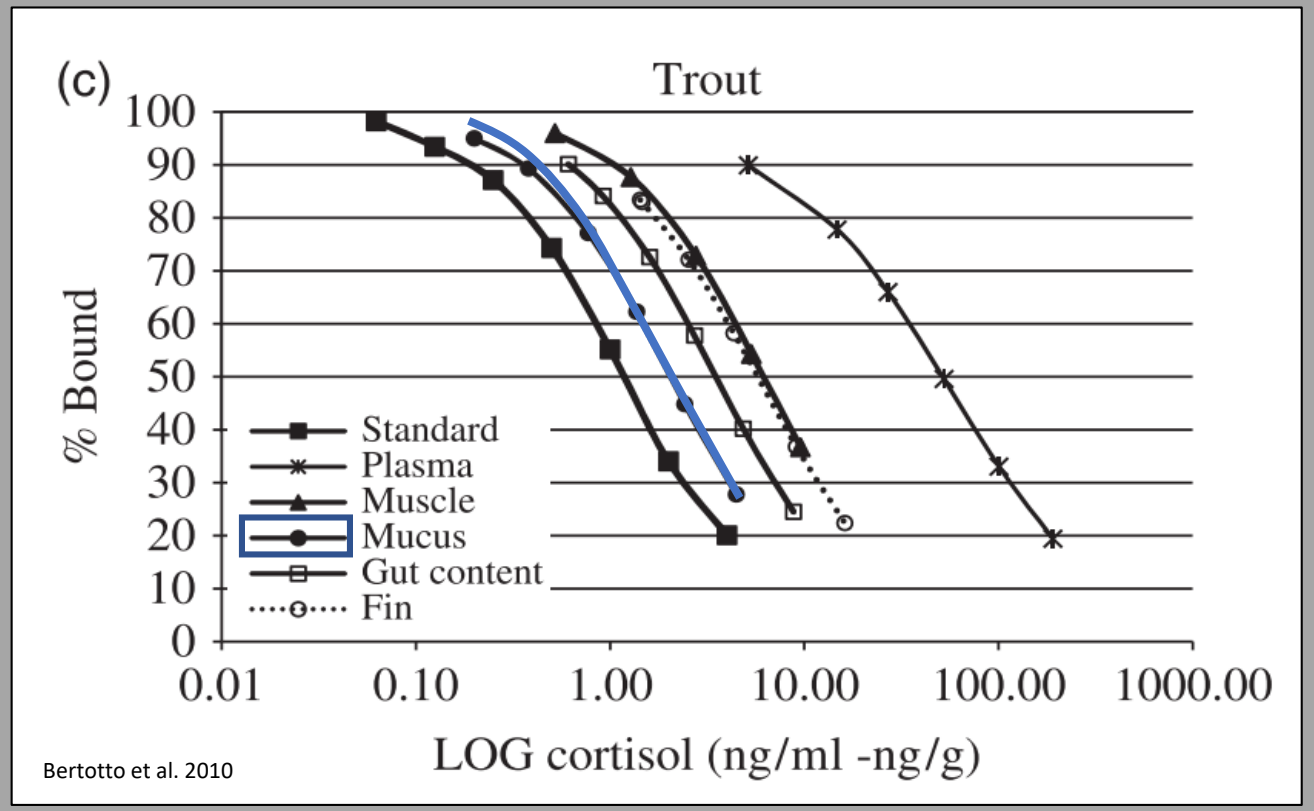
Injury & cortisol response



Baker et al. 2013

Multi-tissue



Bertotto et al. 2010

Assessment/Interpretation

Cortisol kinetics

Stress induction timing

Injections **ACTH** or Control

Repeated sampling
(ACTH injection only)

Cortisol elimination/ clearance

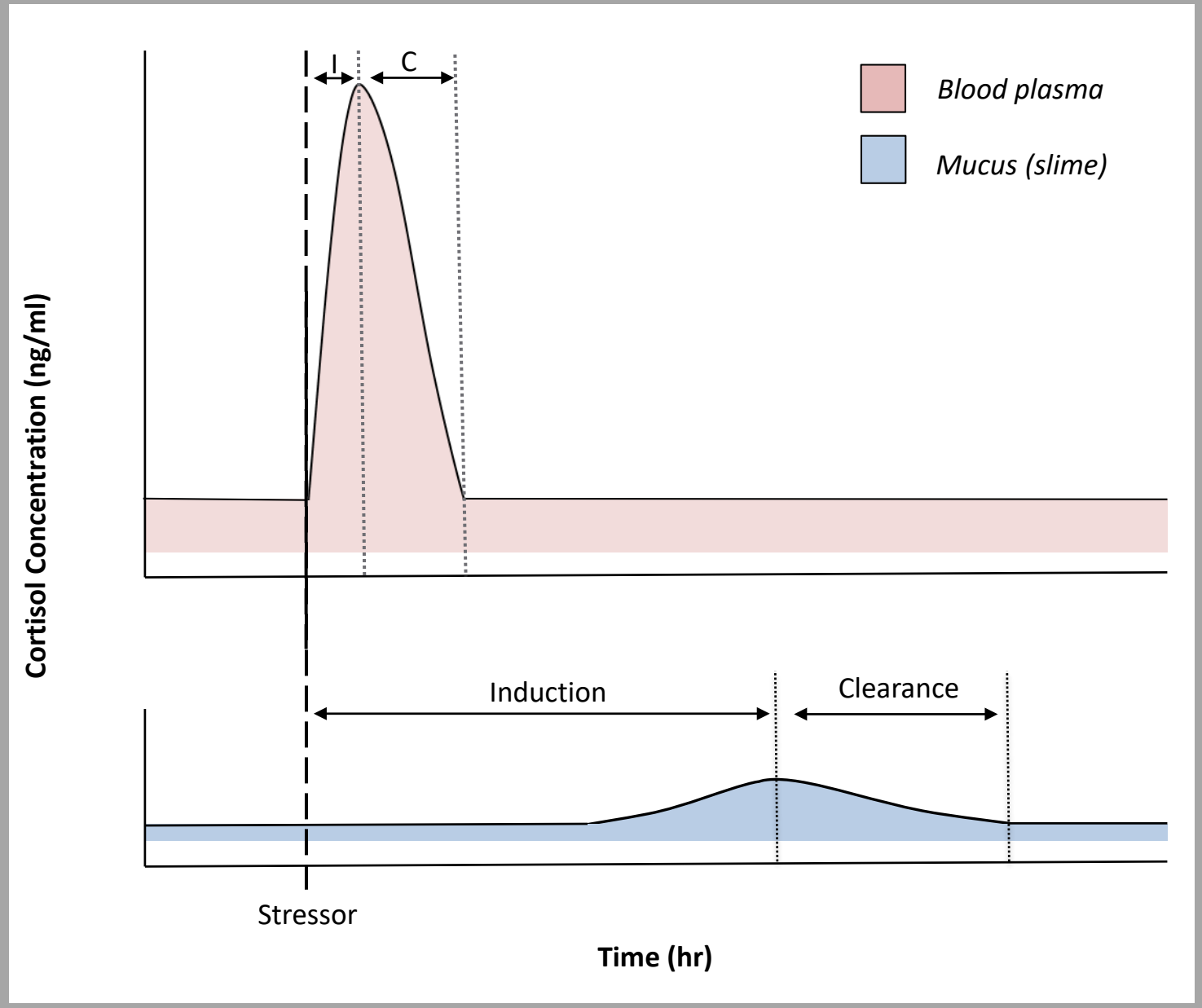
Injections **Cortisol** or Control

Wild-caught adult halibut
- 20 – 31 inches (50.8 – 78.7 cm)
- 10 sampling times (0-84 hrs) post-injection

Treatments
- ACTH
- Cortisol
- Control

Samples collected
- Blood
- Mucus

Expected stress response

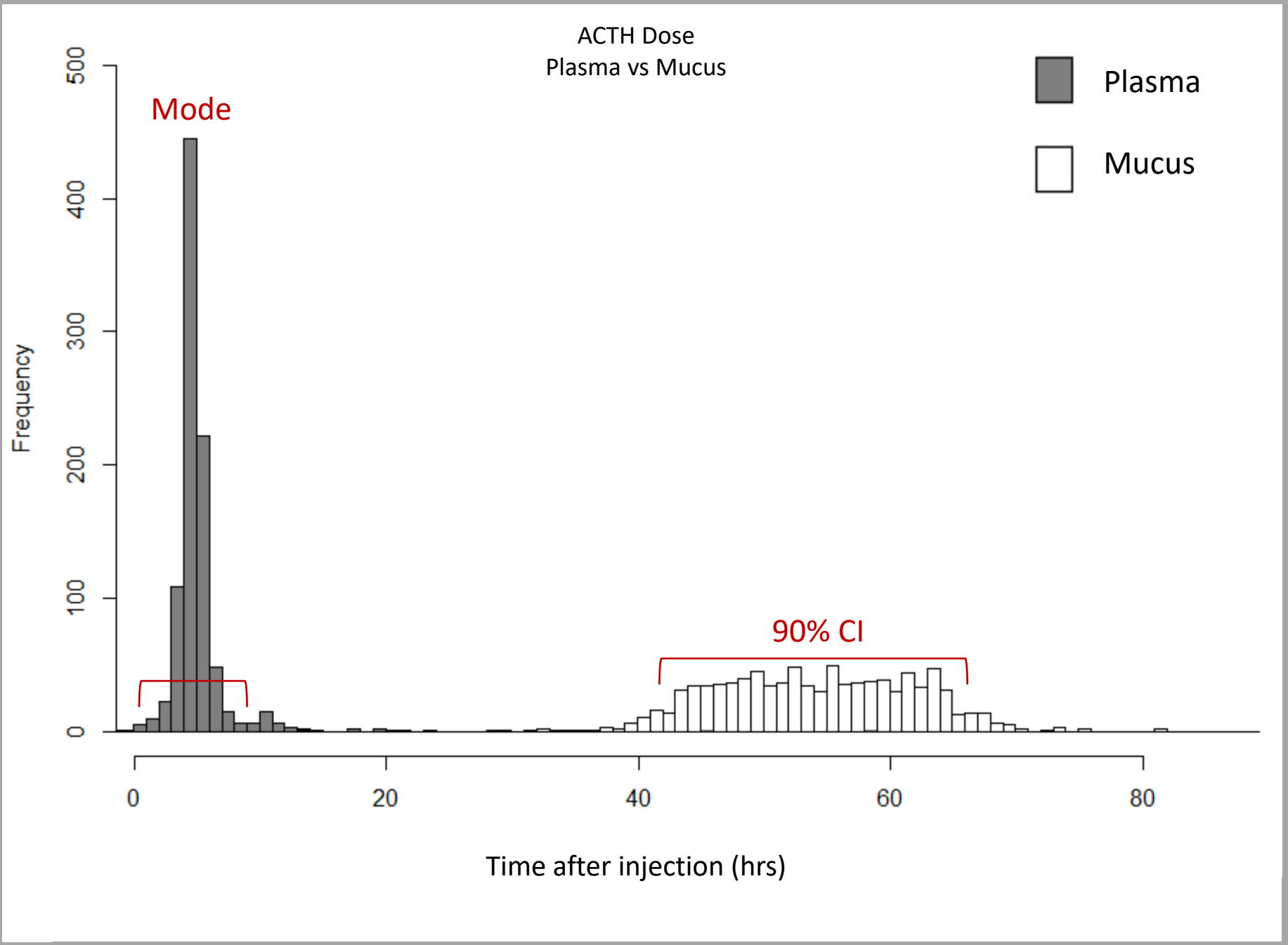


Plasma
- Initial cortisol superhighway
- Concentrated

Mucus
- Part of cortisol excretory path
- Larger surface area, passive diffusion

ACTH
- Induces stress response
- 1st half of curve

Cortisol
- Washout/clearance rate
- 2nd half of curve



Bayesian analysis

3rd order polynomial

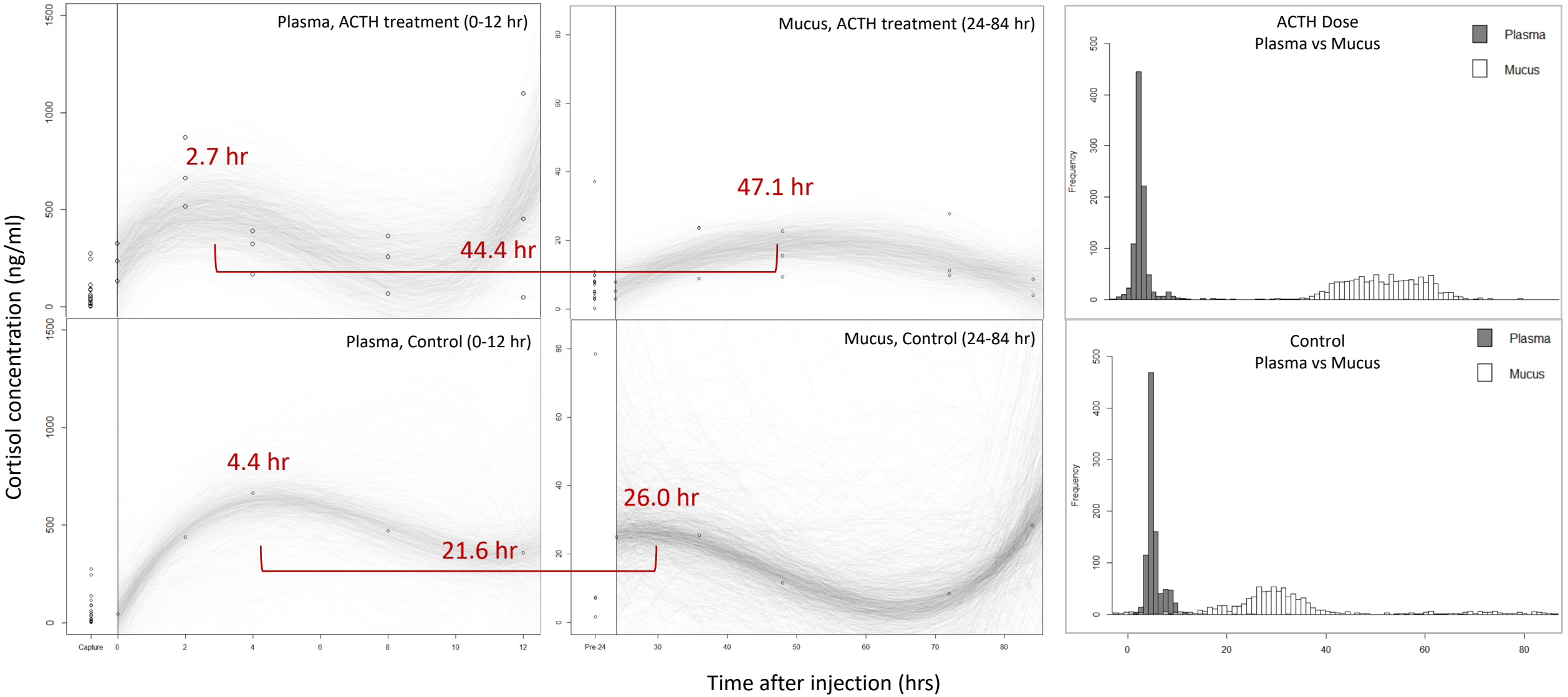
- $cortisol \sim a + bt + ct^2 + dt^3$
- Same analysis for each subset
- First derivative to find maximum and minimum points

Histograms: predicted timing of initial peak from stressor, t_{max}

- Posterior distribution
- Mode, 90% credible interval

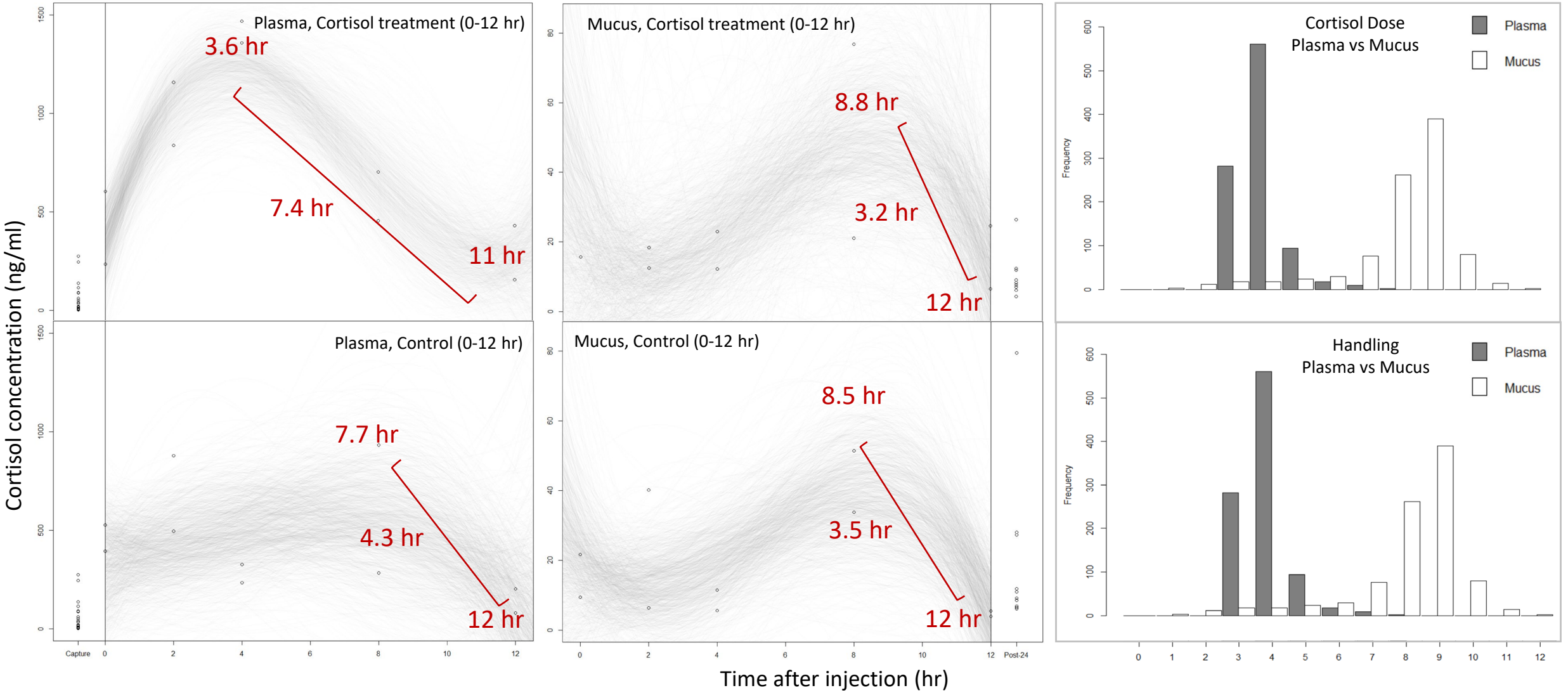
ACTH Injection

Induction Time

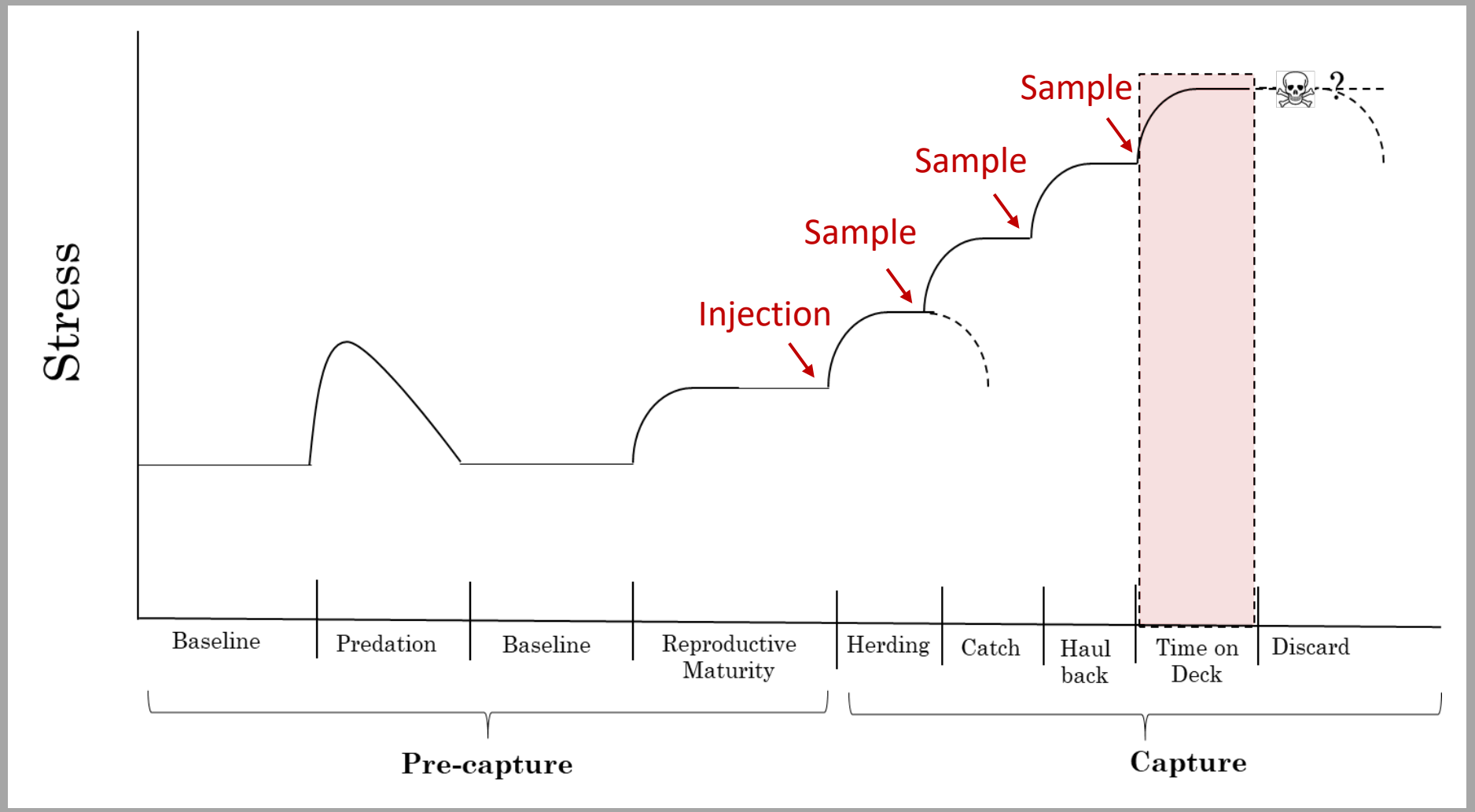


Cortisol Injection

Clearance rate



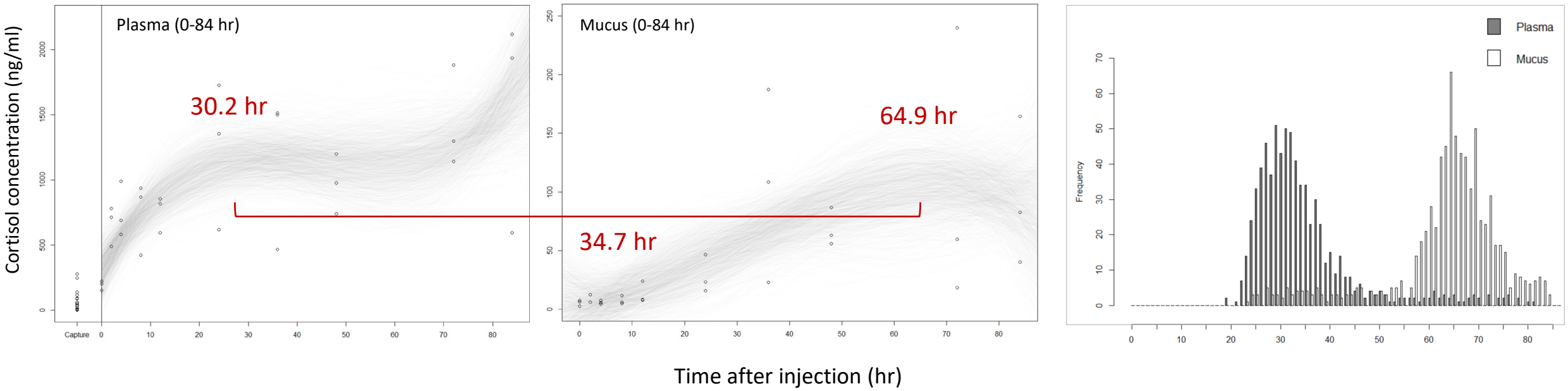
Repeated sampling



Repeated stressors

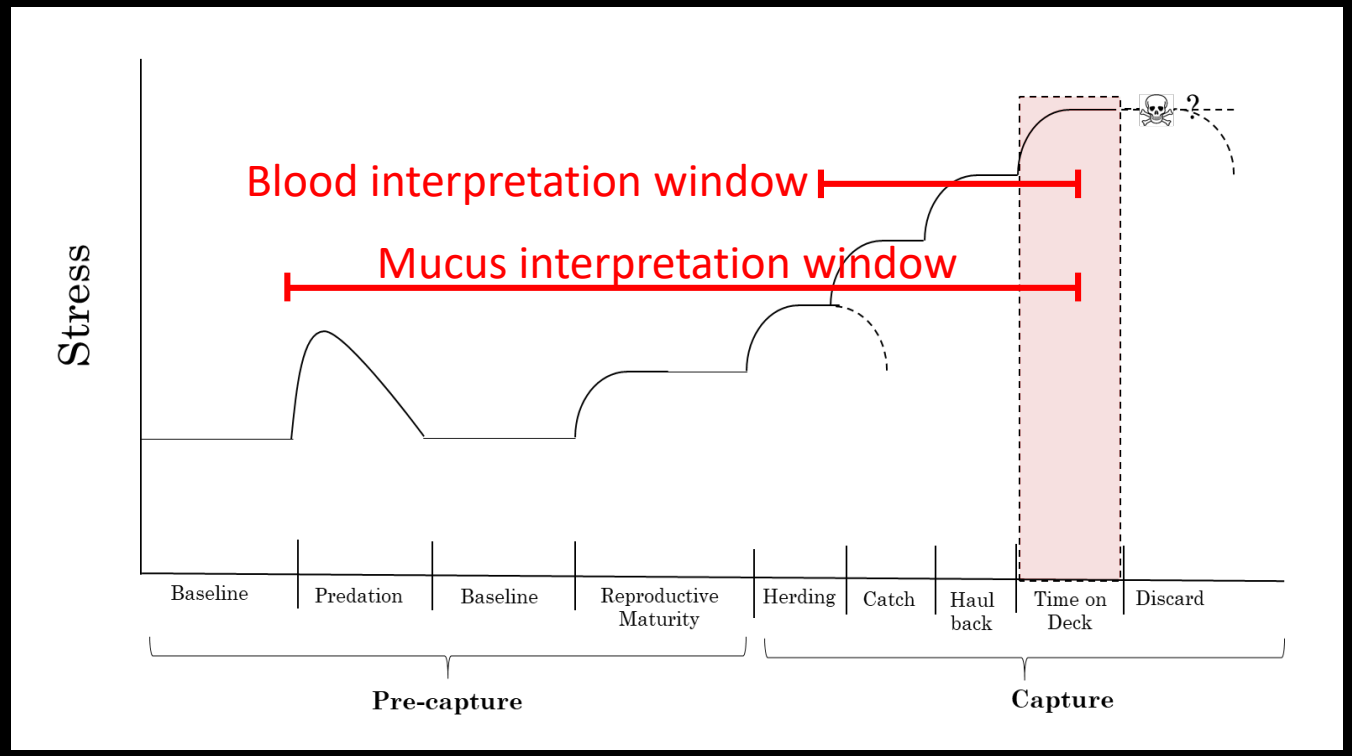
- Additive stress
- Stepwise increases in chinook salmon (Barton et al., 1986)

Repeated Sampling – ACTH Injection



- Stepwise increases in plasma- repeated effects of handling
- No habituation evident

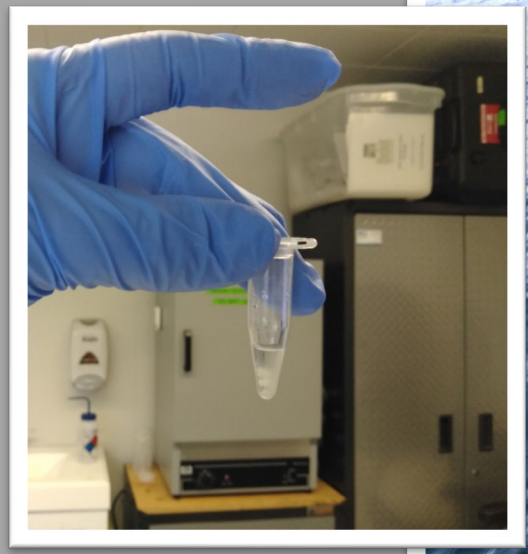
Discussion

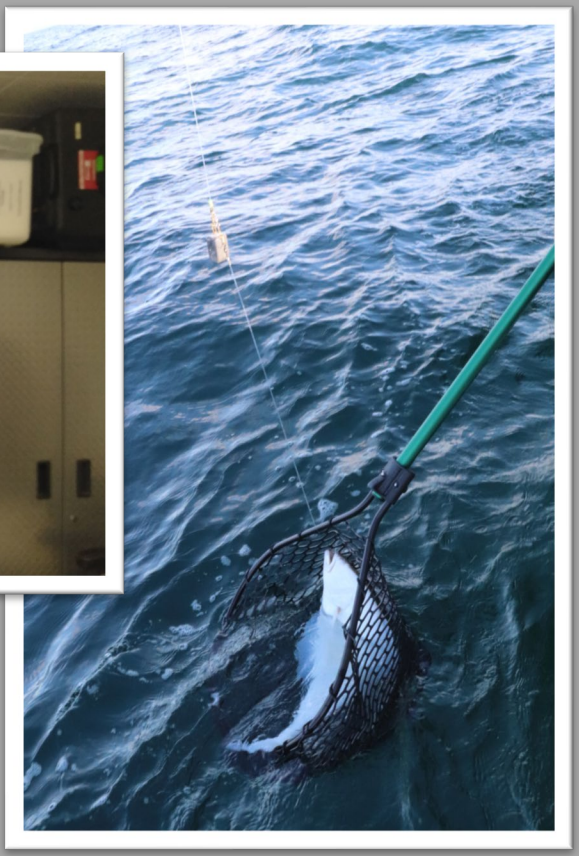


- Blood: Capture condition (2-4 hr prior)
- Mucus: Pre-capture conditions (> 21 hr prior)
- Multi-tissue approach: blood & mucus samples taken together- more informed view of fish condition

Next steps

- Pair with external fish condition metrics & tagging
- Examine physiological regulatory mechanisms





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