

The Response of Wild Steelhead to Catch-and-Release Angling on the Bulkley River, BC.

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Ministry of Forests,
Lands & Natural
Resource Operations



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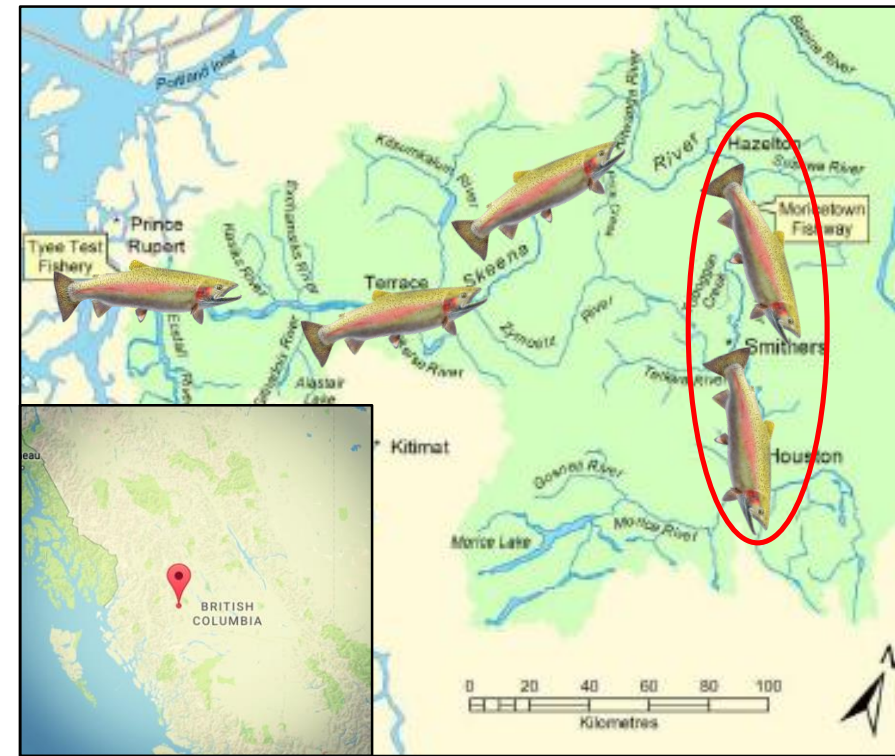
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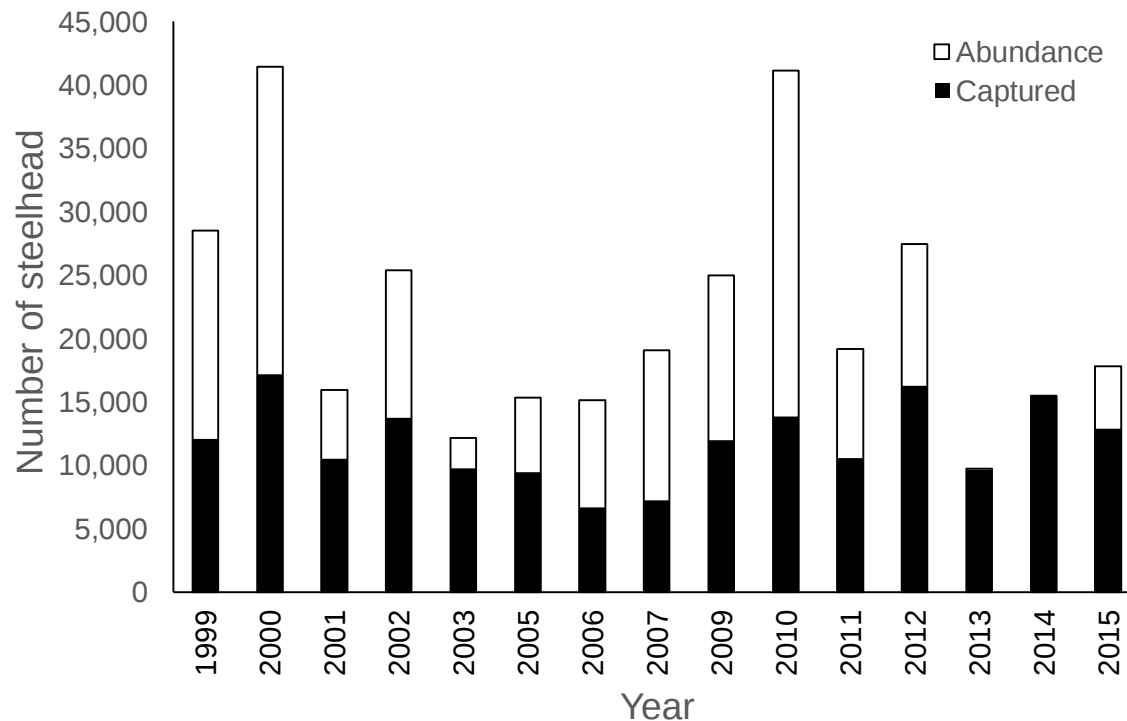
Bulkley River

- Largest tributary of the Skeena River
- Test fishery, Indigenous salmon fisheries, and recreational fishery
- Catch-and-release of steelhead is mandatory
- High access; effort of 12,000 angler days/season



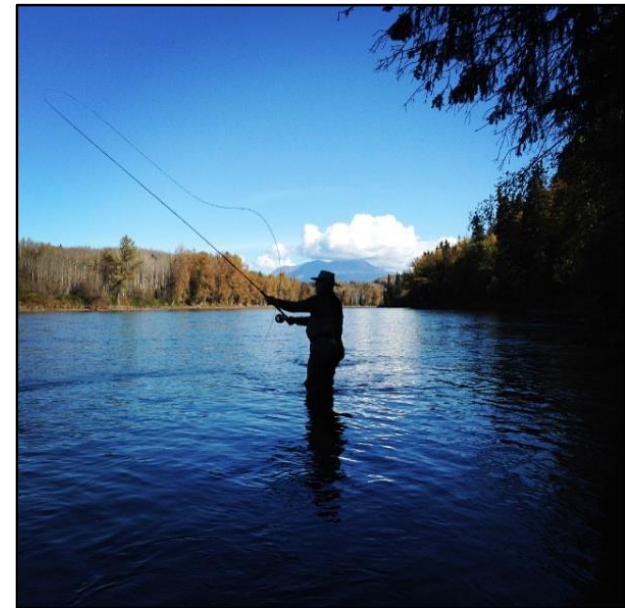
Capture rates

- Mark-recapture and angler surveys suggest ~59% capture efficiency of the Bulkley steelhead run (BC MFLNR)
- Highest capture efficiency during years of low abundance



Purpose

- To evaluate the physiology, behaviour, and survival of wild steelhead following catch-and-release
 - Air exposure treatment (0, 10, 30 secs)
 - Varying angling durations, landing methods (net vs. tail-grab), and water temperatures





1: Capture

- Single barbless hooks, no bait, 80% fly fishing





2: Landing method

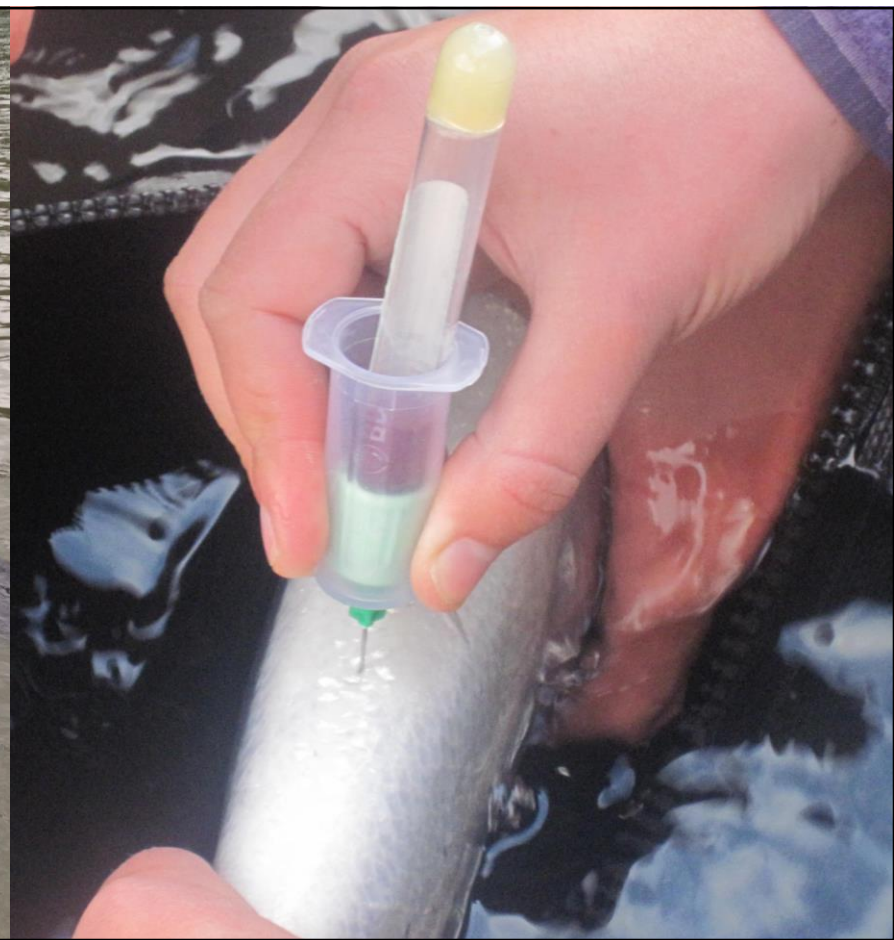




3: Air exposure (Baseline, 0, 10, or 30 secs)



4: Reflex test, then held (20mins) and blood sampled



5: Blood testing

- Indices of metabolic stress



Glucose Meter



pH Meter

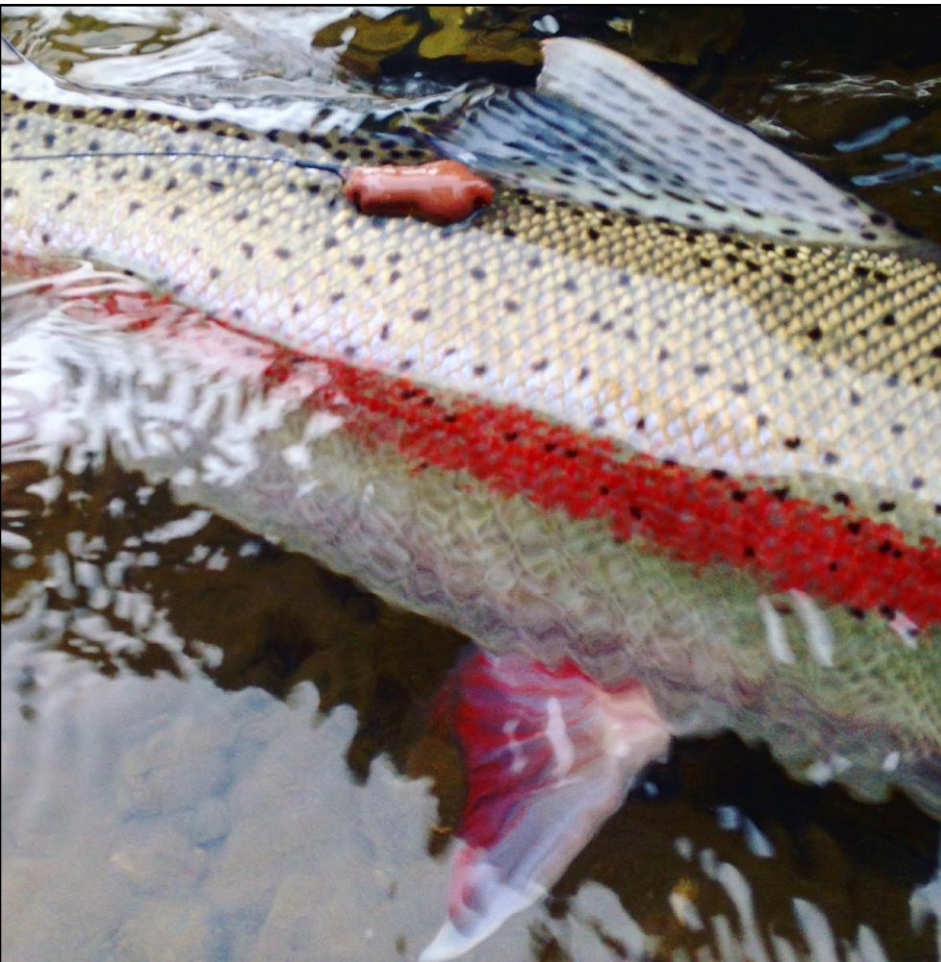


Lactate Meter



Baseline fish

6: Radio-tagged (post-release behaviour and fate)

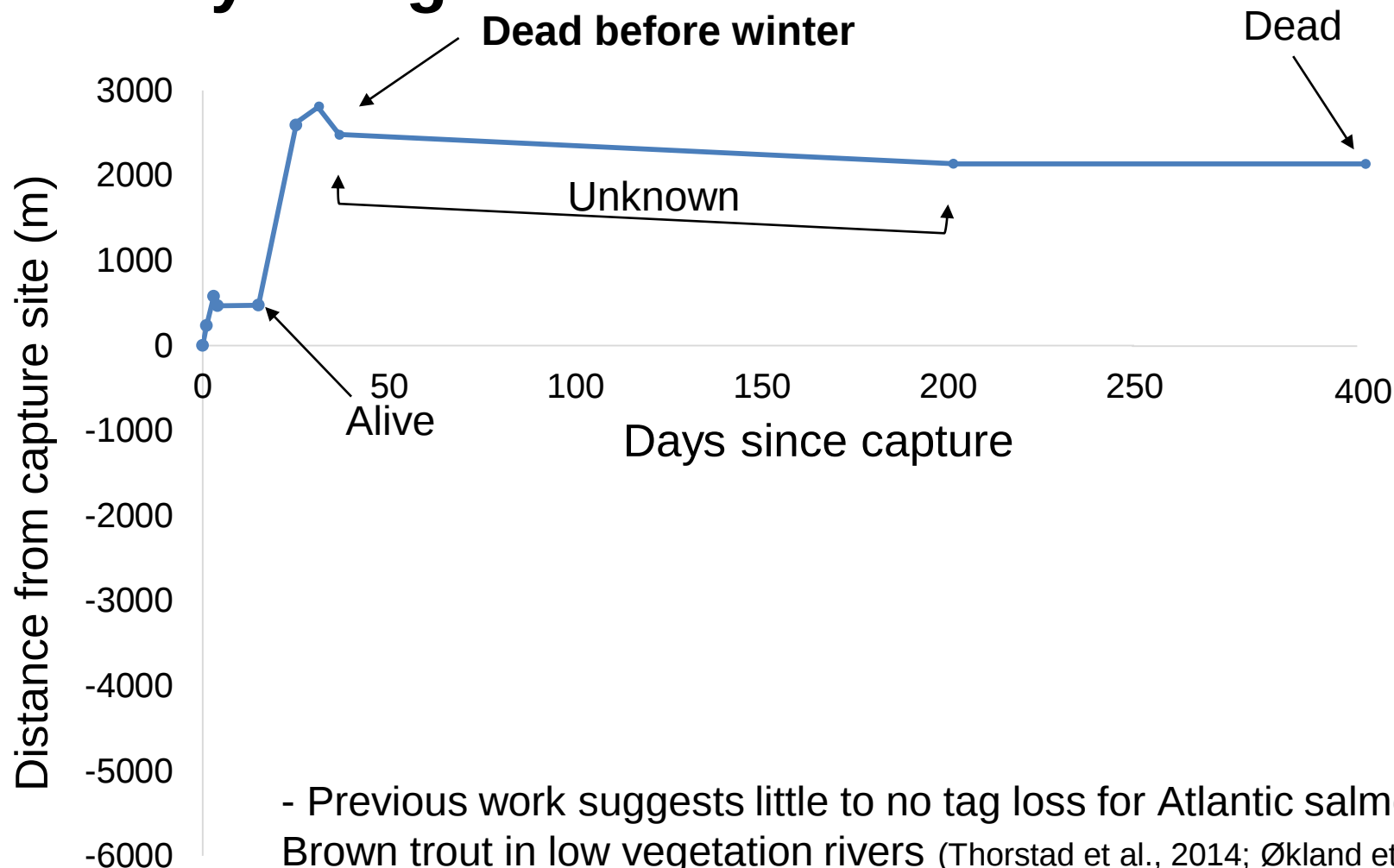




6: Long-term tracking April and August 2017



Mortality designation



- Previous work suggests little to no tag loss for Atlantic salmon or Brown trout in low vegetation rivers (Thorstad et al., 2014; Økland et al., 1996; Aarestrup and Jepsen, 1998)

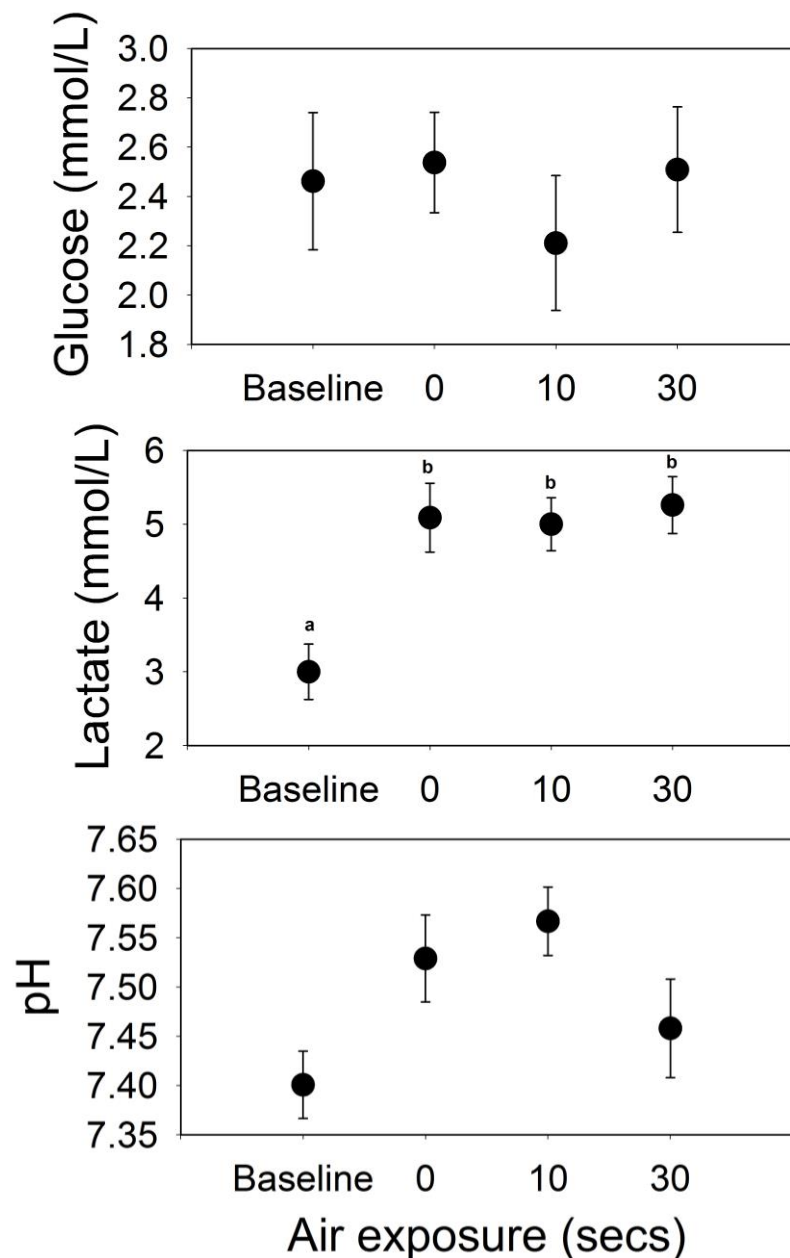


Treatment	Physiology	Behaviour
0 sec	n=18	n=22
10 sec	n=12	n=25
30 sec	n=15	n=20
Baseline (Physiology only)	n=14	NA
Total	n=59	n=67

- No significant differences in landing method, angling duration, water temperature, fork length, or sex across air exposure treatments
- Multiple regression models included the variables above

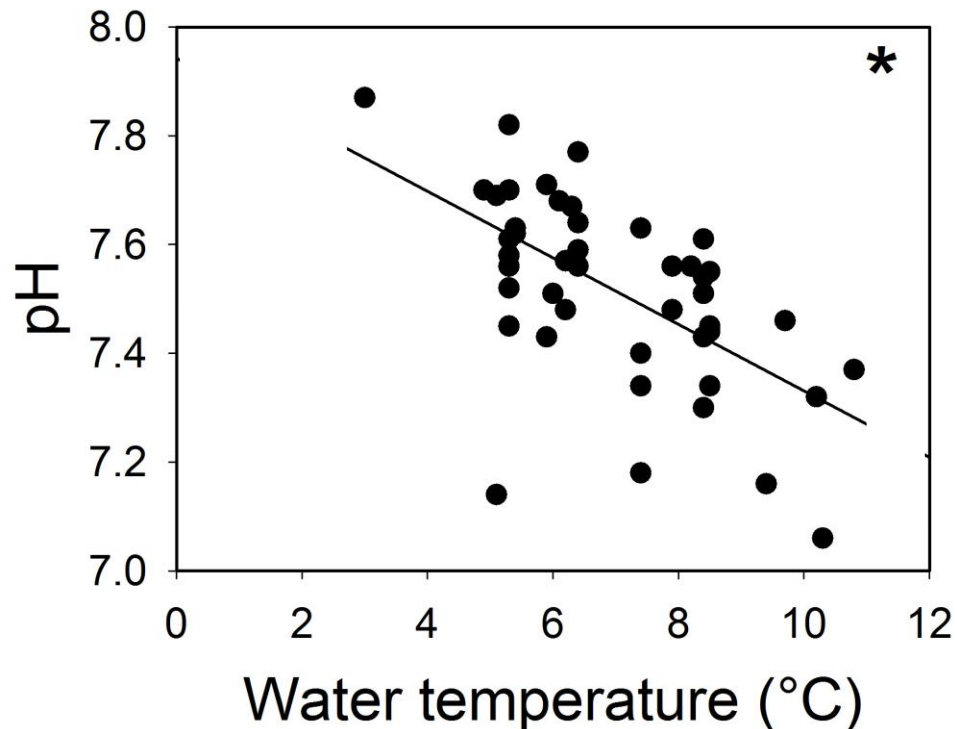
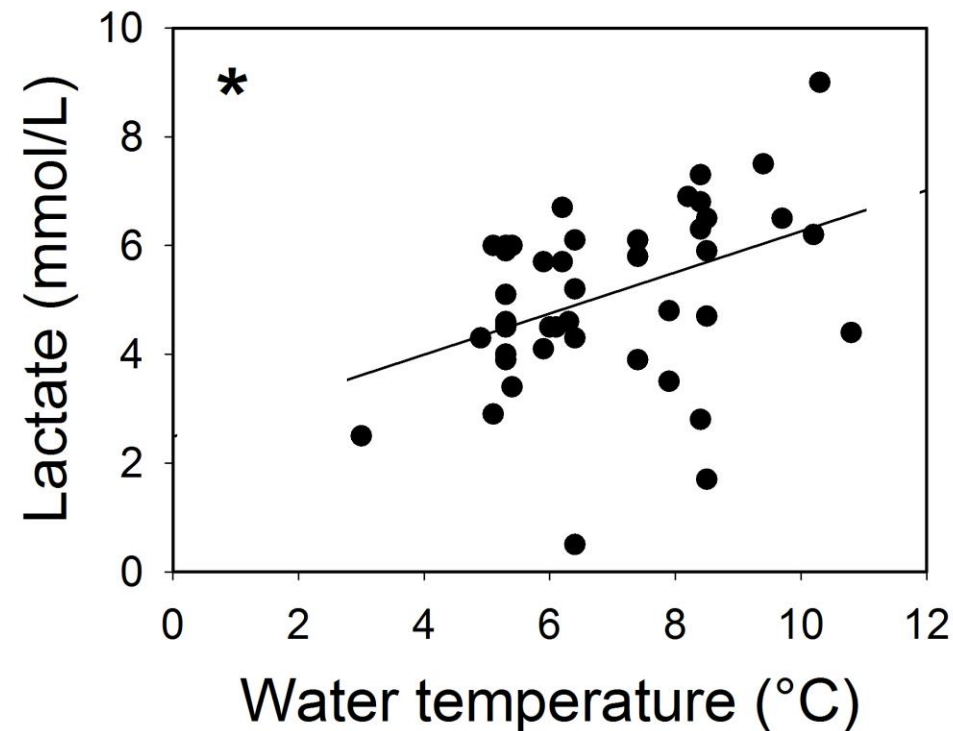
Physiology

- Blood lactate greater in angled fish compared to baseline levels



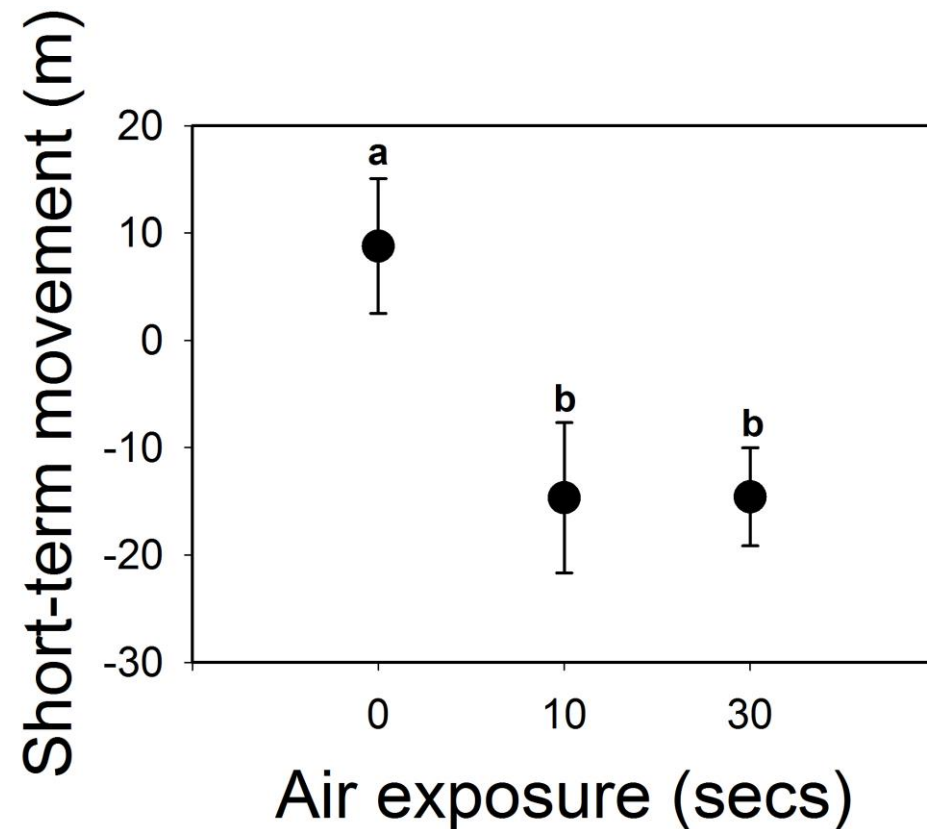
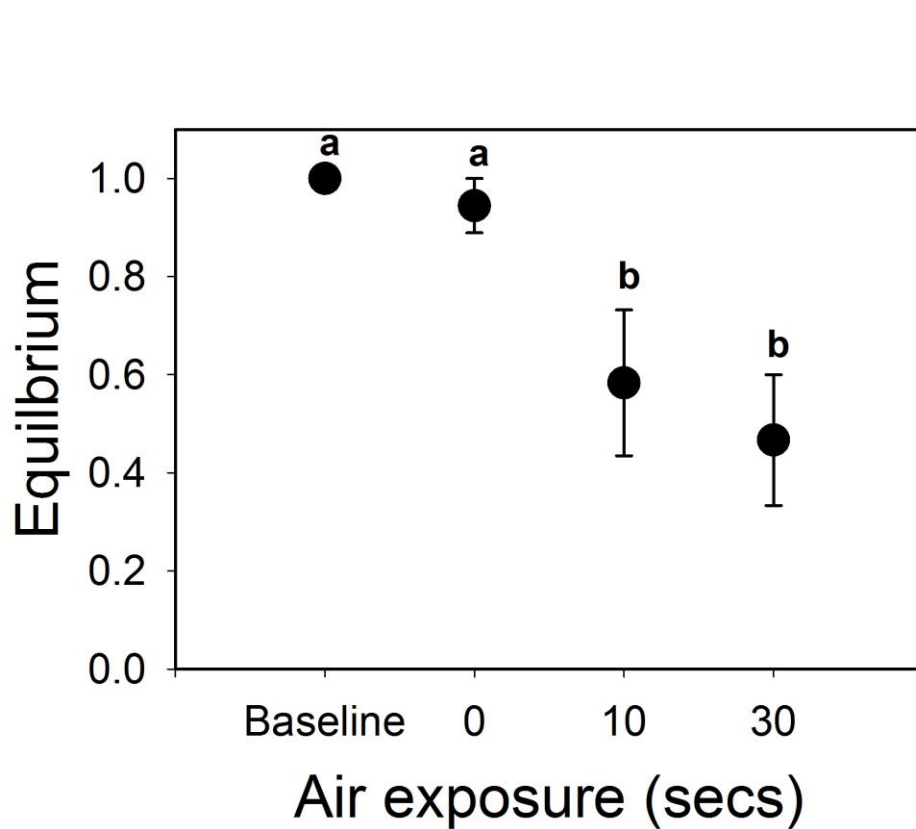
Physiology

- Water temperature correlates with blood lactate and pH



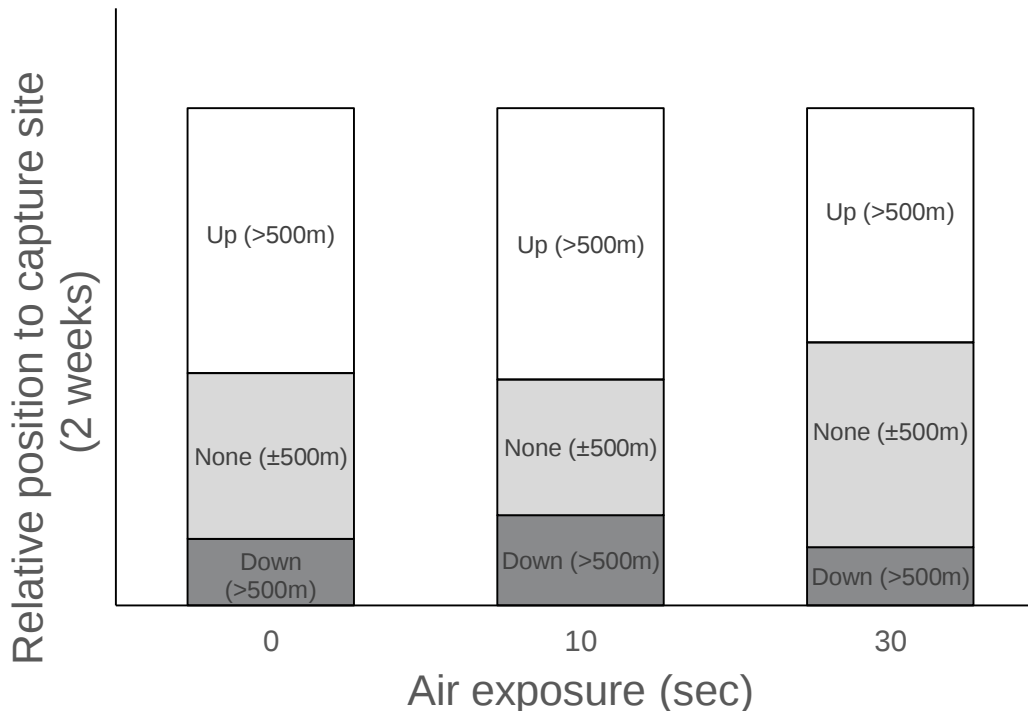
Reflex and Movement

- 10 secs or more of air exposure increases reflex impairment and downstream movement



Longer-term movement

- Average movement was 11.5km and ranged from -11km to +61km over the 7-month period (anglers intercept holding fish vs. active migrants)
- Air exposure had little influence on 2 week movement

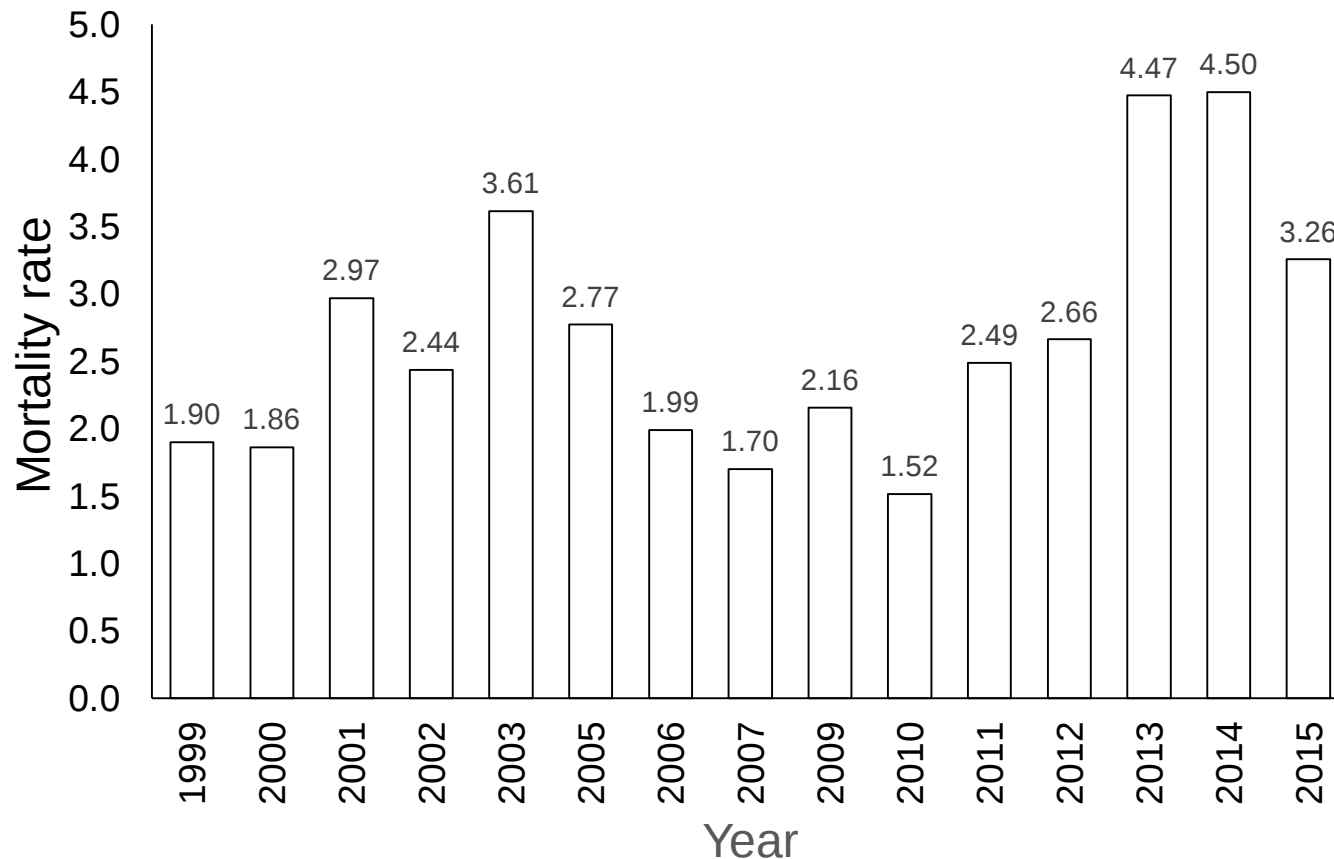


Mortality and Injury

- 2.3% Deep hooked fish (tongue)
 - 3-day mortality ~4.5%
 - Pre-winter mortality ~6.0%
 - Pre-spawn mortality ~15% (13.5-25.0%)
-
- Average hooking mortality for Salmonids = 15.9%
(Huhn and Arlinghaus, 2011)
 - Mortality estimates for *O. mykiss* range from 0-88.5%
 - Chilliwack River wild winter-run steelhead = 4.8%
(Nelson et al., 2005)
 - Mortality for bait-angled Steelhead ~4.1% (Hooton, 2001)

Mortality across years

- Catch-and-release angling mortality averages 2.7% (1.5 - 4.5%) for the entire run.



Discussion

- Angling in general increases blood lactate compared to baseline
- Air exposure of 10 and 30 secs increases short-term behavioural impairment but not long-term
- Temperature correlated with blood physiology
- Angling duration, sex, size had little influence on physiological and behavioural responses



Communicating best practices

Best practices

- Reduce air exposure to less than 10 secs; voluntary tool
- Take extra precaution when angling in warmer water temperatures

Adopting best practices (Guckian et al., In press)

- Paired this catch-and-release work with a social science survey
- Survey identified anglers' beliefs and attitudes towards evidence-based best practices
- 197 respondents
- 44% reported knowing a 'great deal' about 'best practices' for steelhead and feel 50% of other anglers know and use them



Communicating best practices

- Best practices are self-taught, learned from other anglers, and online
- Partnering with Keepemwet Fishing to communicate best practices to Bulkley River anglers (Danylchuk et al., In press)



Releasing Steelhead *Best Practices*

Given the widespread decline of wild steelhead populations, recreational fisheries for steelhead are primarily catch-and-release, including the famed run of the Bulkley River, BC. The success of catch-and-release as a conservation tool is based on the premise that released fish survive and do not suffer any negative consequences. Science has shown, however, that angler behaviour can have dramatic influences on the outcome of catch-and-release angling, and that research is needed that specifically focuses on wild steelhead to identify opportunities for refining handling practices to ensure the best outcome for fish.

We worked alongside volunteer anglers on the Bulkley River to study wild steelhead from Sept 2016 to April 2017. During this time, 126 wild steelhead were caught and used in one of two different studies on the impacts of

Summary of Results:

Fight Time and Landing Method

- Fight times were 27% longer when fish were landed by tail grab compared to netting.
- Fight time or landing method had less of an influence on the short-term stress response values and movement measures.

Air exposure

- Air exposure durations of 10 sec and 30 sec increased reflex impairment and short-term downstream movement (both of which are indicators of stress) of steelhead.
- Fish that were not air exposed did not show either of these signs of stress.

Water Temperature

- At higher water temperatures, fish showed higher levels of stress.

Survival

- Deep hooking was the most common reason for steelhead mortality, but only occurred in 2.3% of fish.
- Overall steelhead survival was high at 94.5-96.0% by November, 2016
- Estimated total pre-spawn mortality was 13.5-15.0%

What should anglers do?

- We recommend that anglers minimize air exposure to less than 10 sec
- We also advise anglers to be more delicate with fish (reduce air exposure and handling) when angling at warmer water temperatures

For more information, see



Conclusions and Future Work

- Provides scientific rigor to anecdotal claims on ‘best practices’ for steelhead
- Best practices guidelines and mortality estimates provide relevant information to other steelhead recreational fisheries
- Future work could evaluate the influence of air exposure on steelhead reproductive success (parentage analysis)

A person wearing a hat and waders is standing in a calm lake, fishing. The background features a dense forest of trees with some autumn-colored foliage, and a range of mountains under a blue sky with scattered white clouds. The person's reflection is visible in the water.

Thank you!