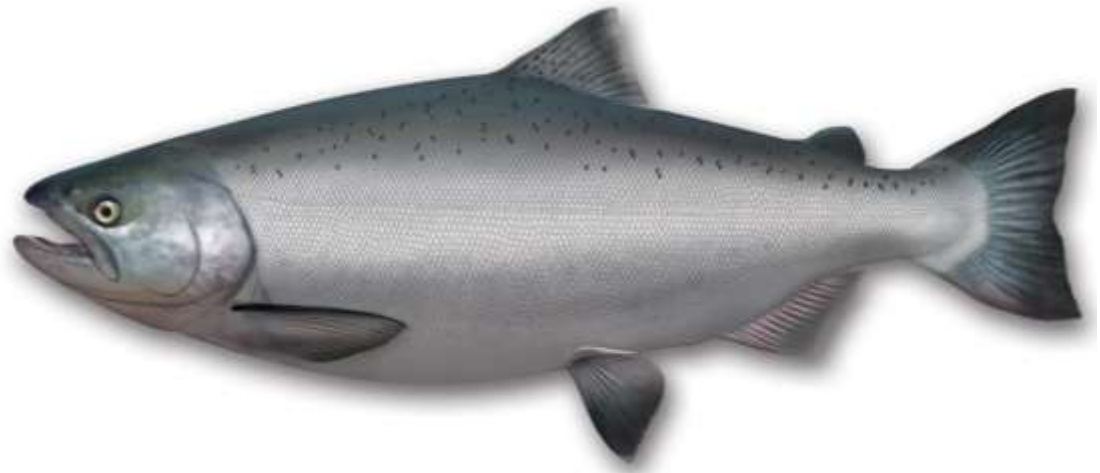


NZ CHINOOK SALMON SMOLT RELEASE STRATEGIES

— historical results & recommendations

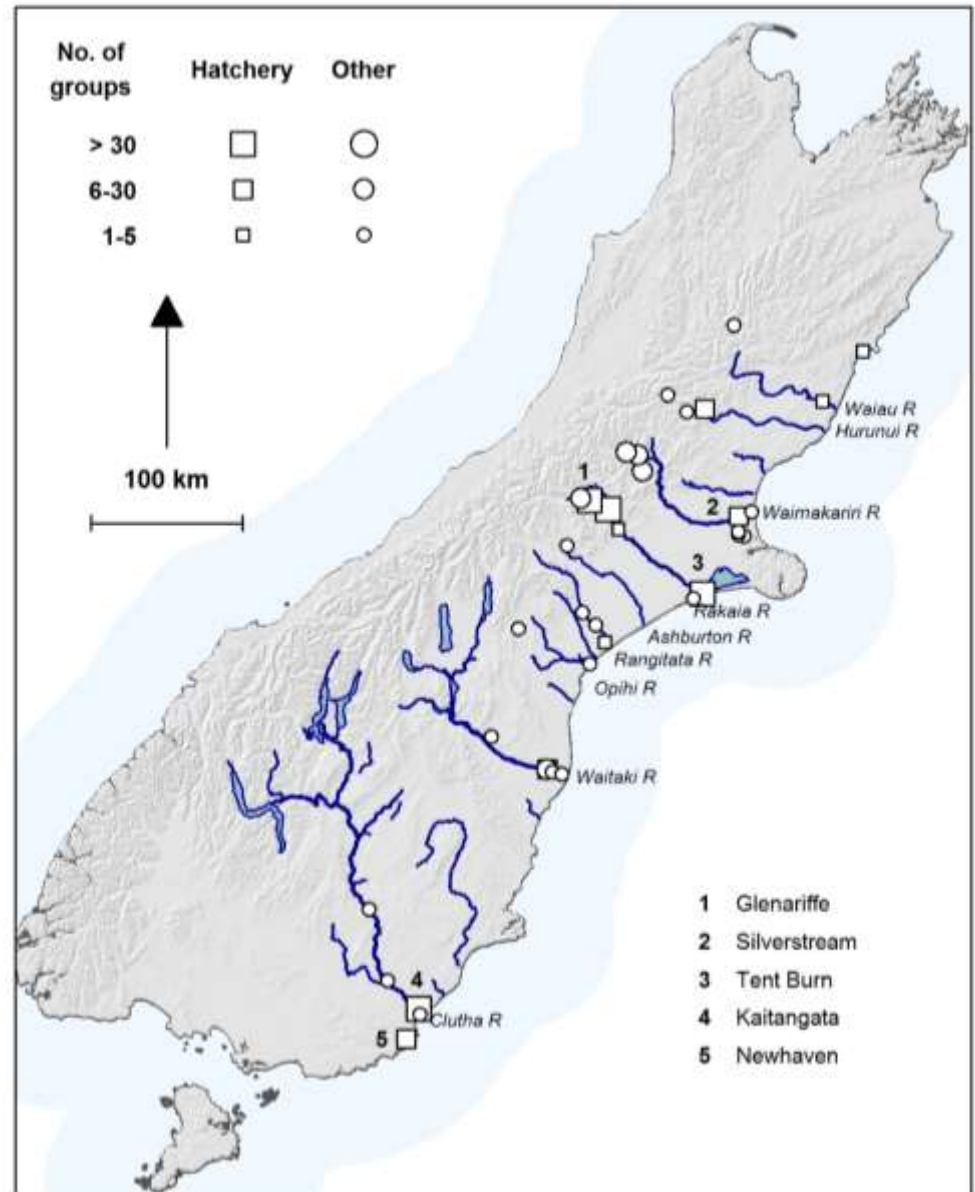


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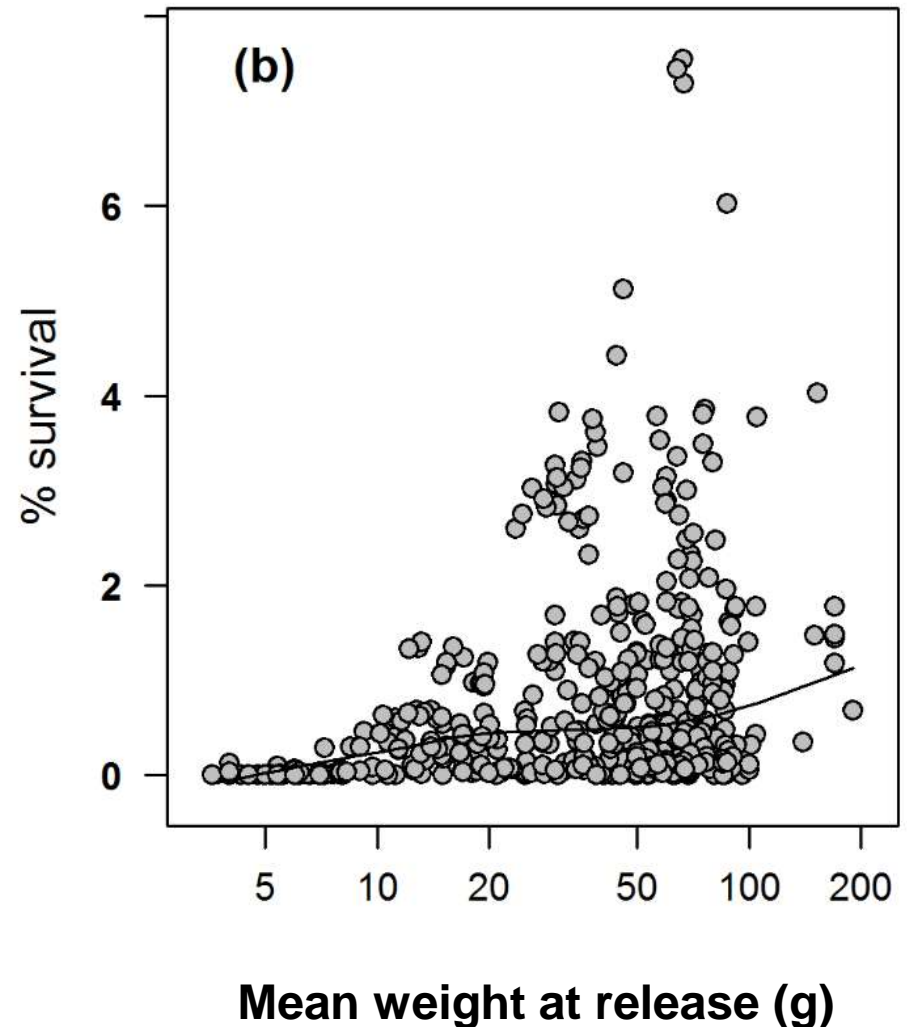
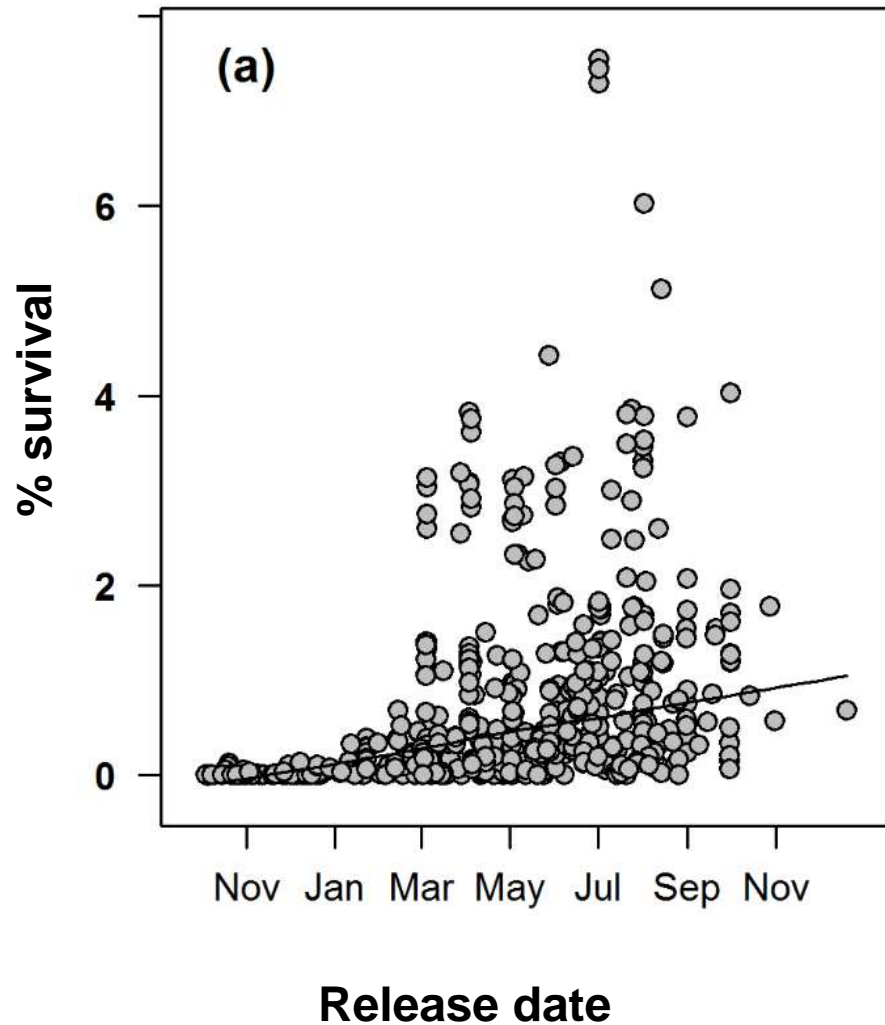


HISTORICAL RELEASES OF CHINOOK SALMON

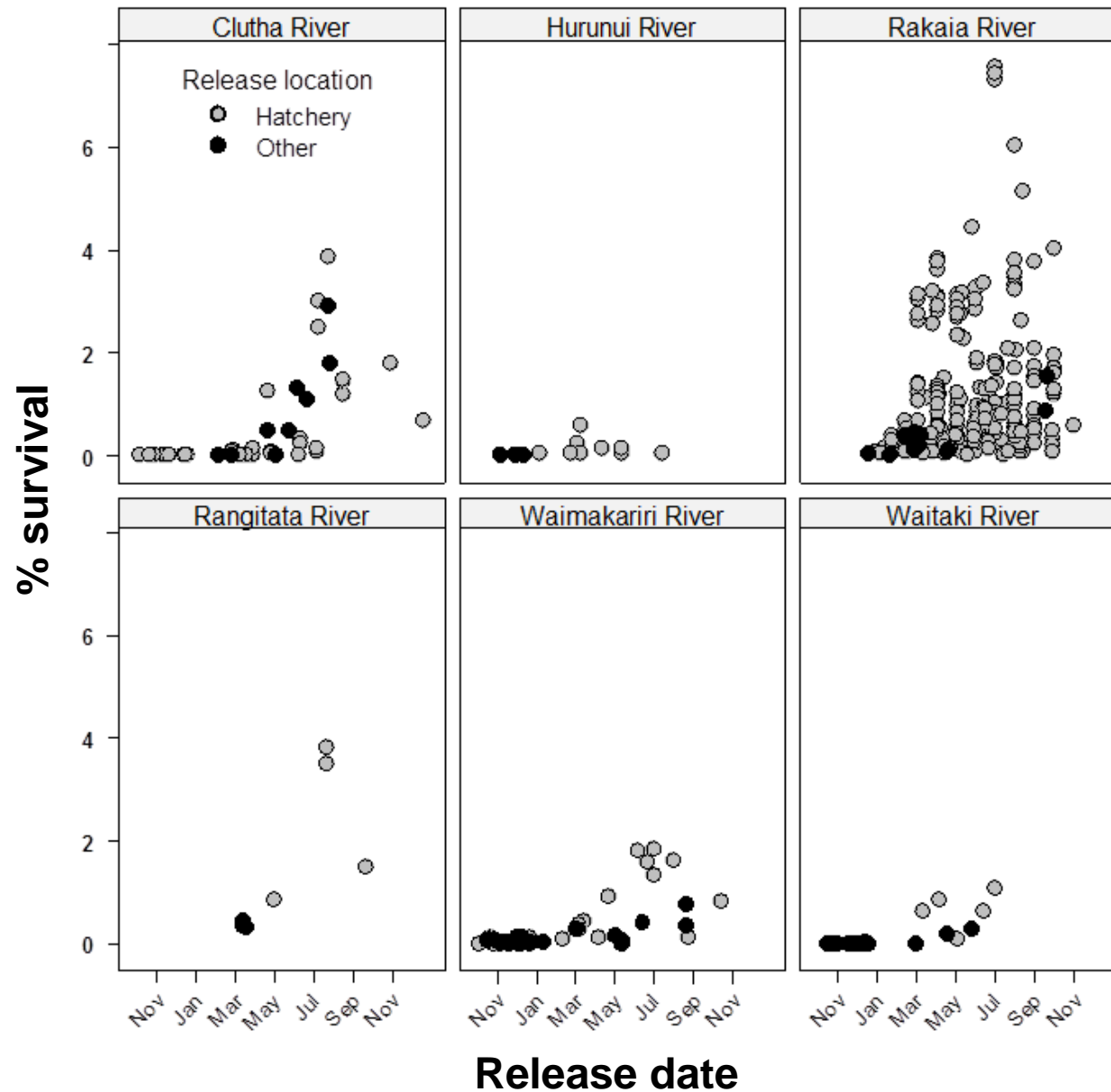
— hatchery releases for ocean ranching



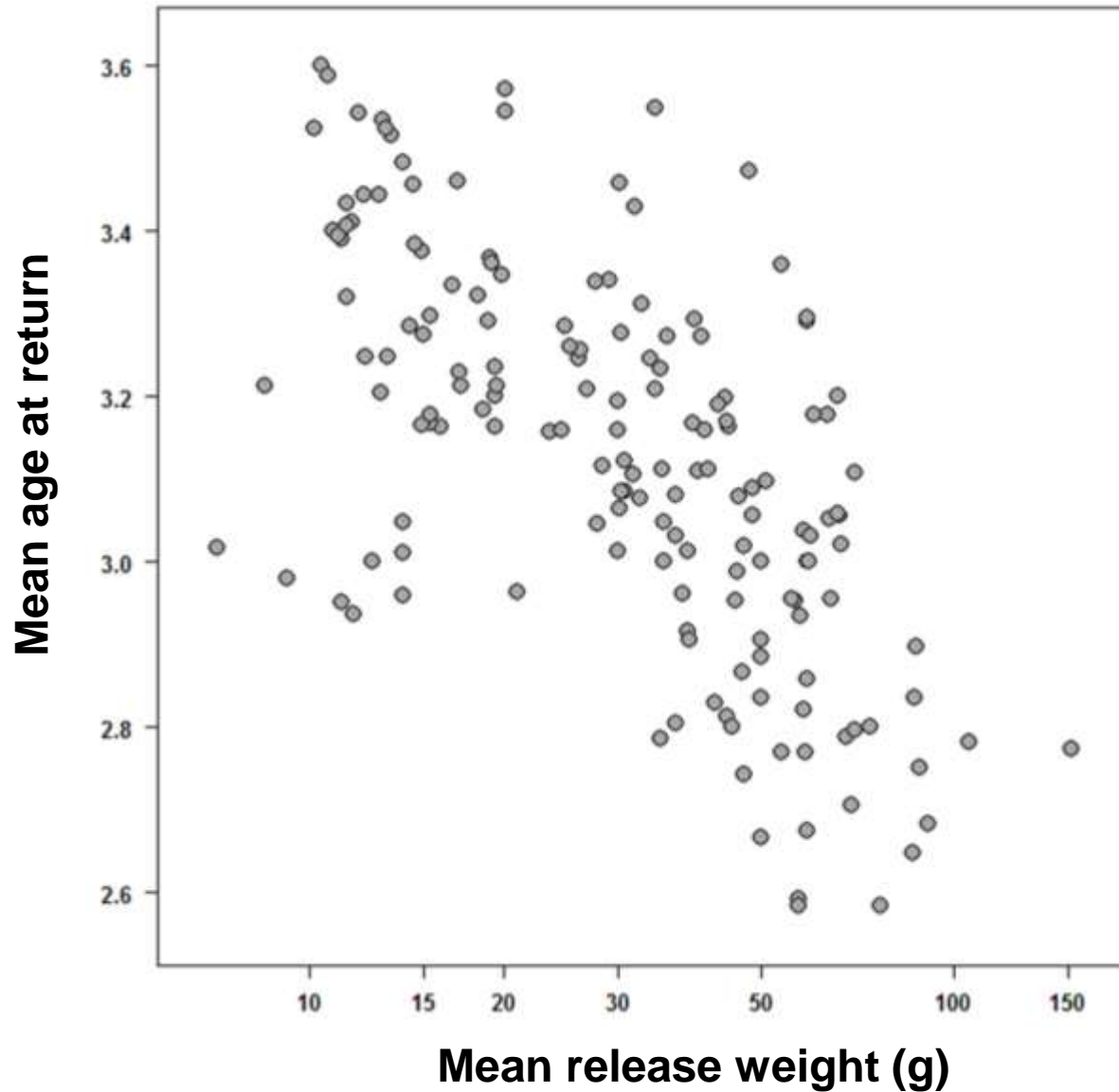
SMOLT SIZE & RELEASES DATE ARE IMPORTANT FACTORS



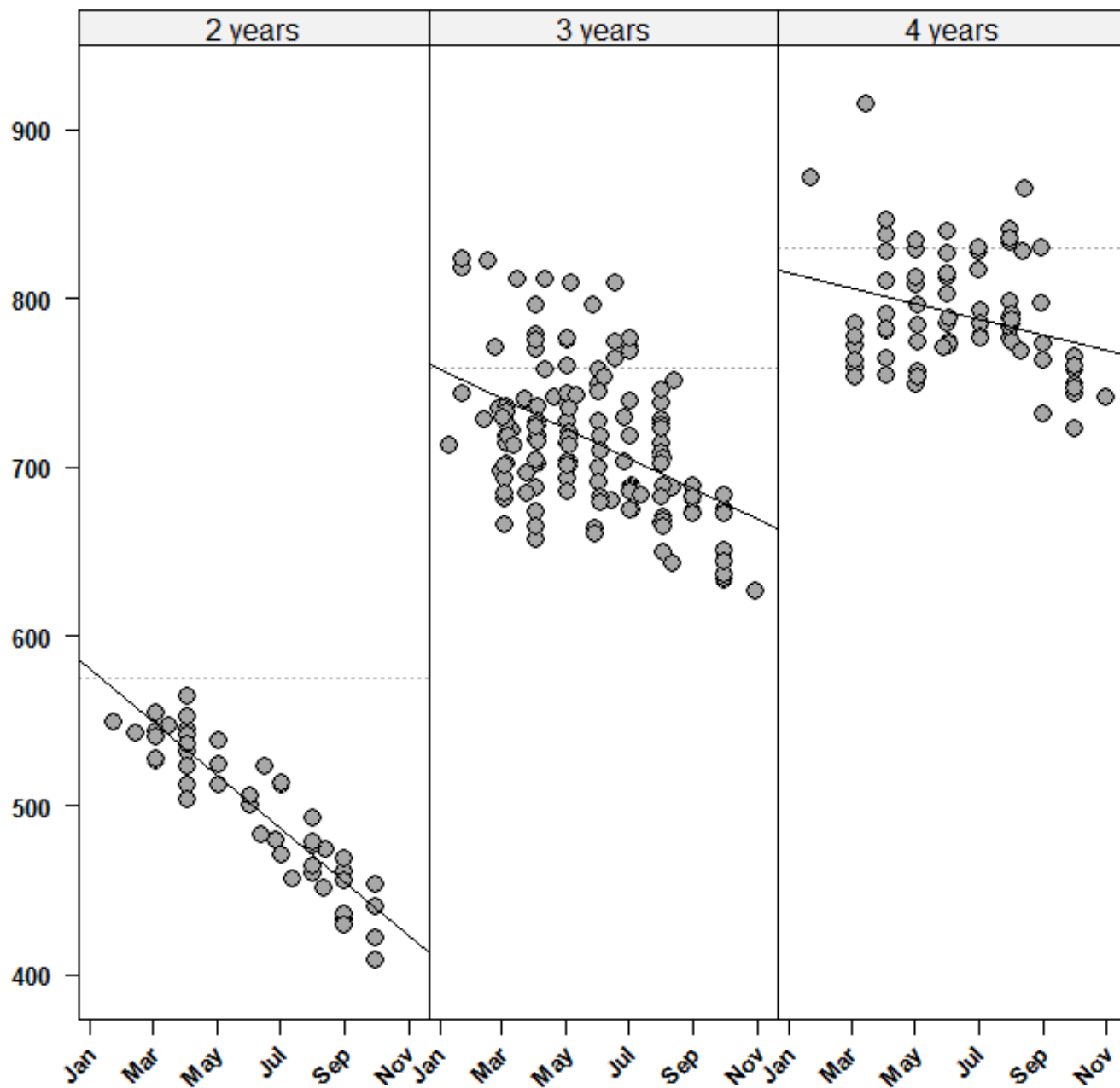
RELEASES OF SMOLT FROM A LOCAL HATCHERY OUTPERFORMS THOSE FROM OTHER LOCATIONS



WEIGHT AT RELEASE INFLUENCES AGE AT RETURN



Mean length (mm)



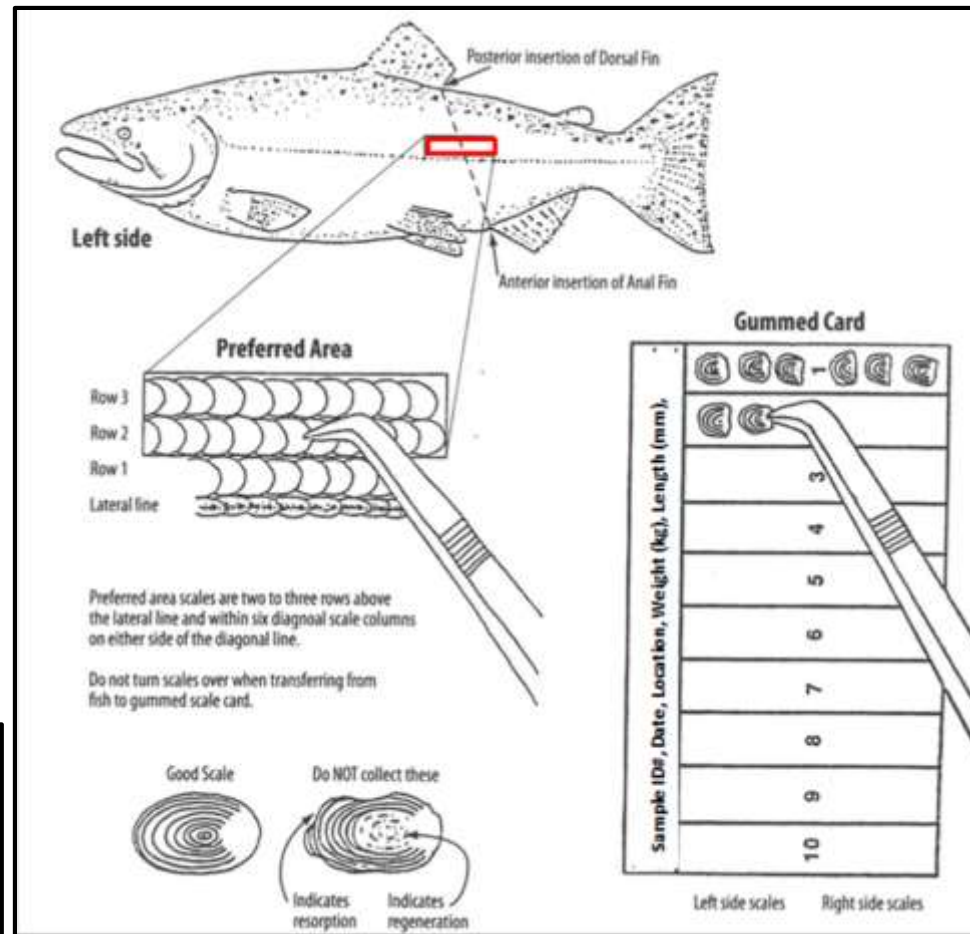
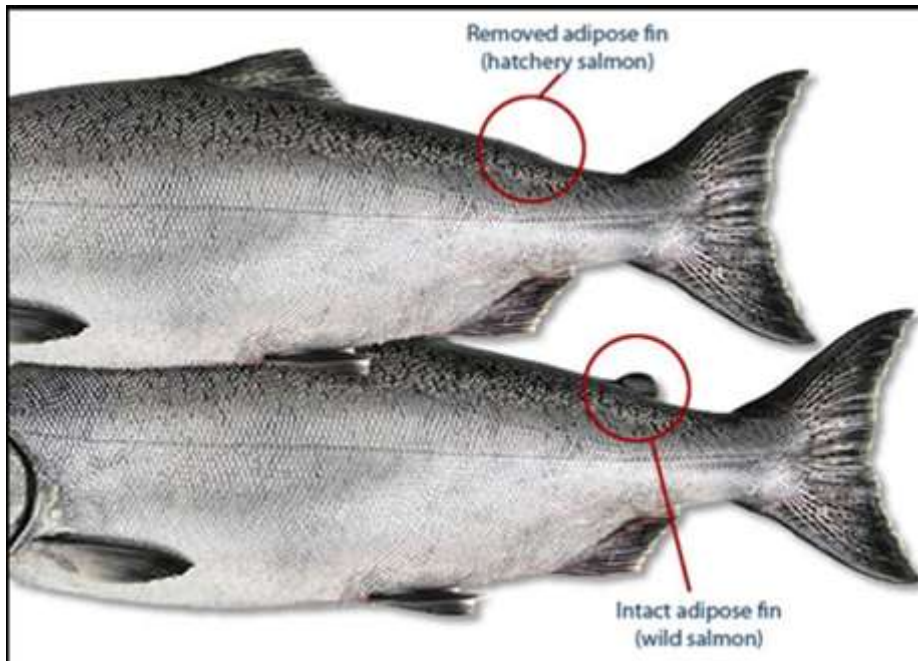
Release date

WHAT CAN WE LEARN FROM THIS?



IT IS DIFFICULT TO MANAGE WHAT YOU DO NOT MONITOR...

RESEARCH & MONITORING



Citizen science:
Anglers helping Fish & Game

SCALE PATTERN ANALYSIS:

tree rings & salmon scales both tell us a story...

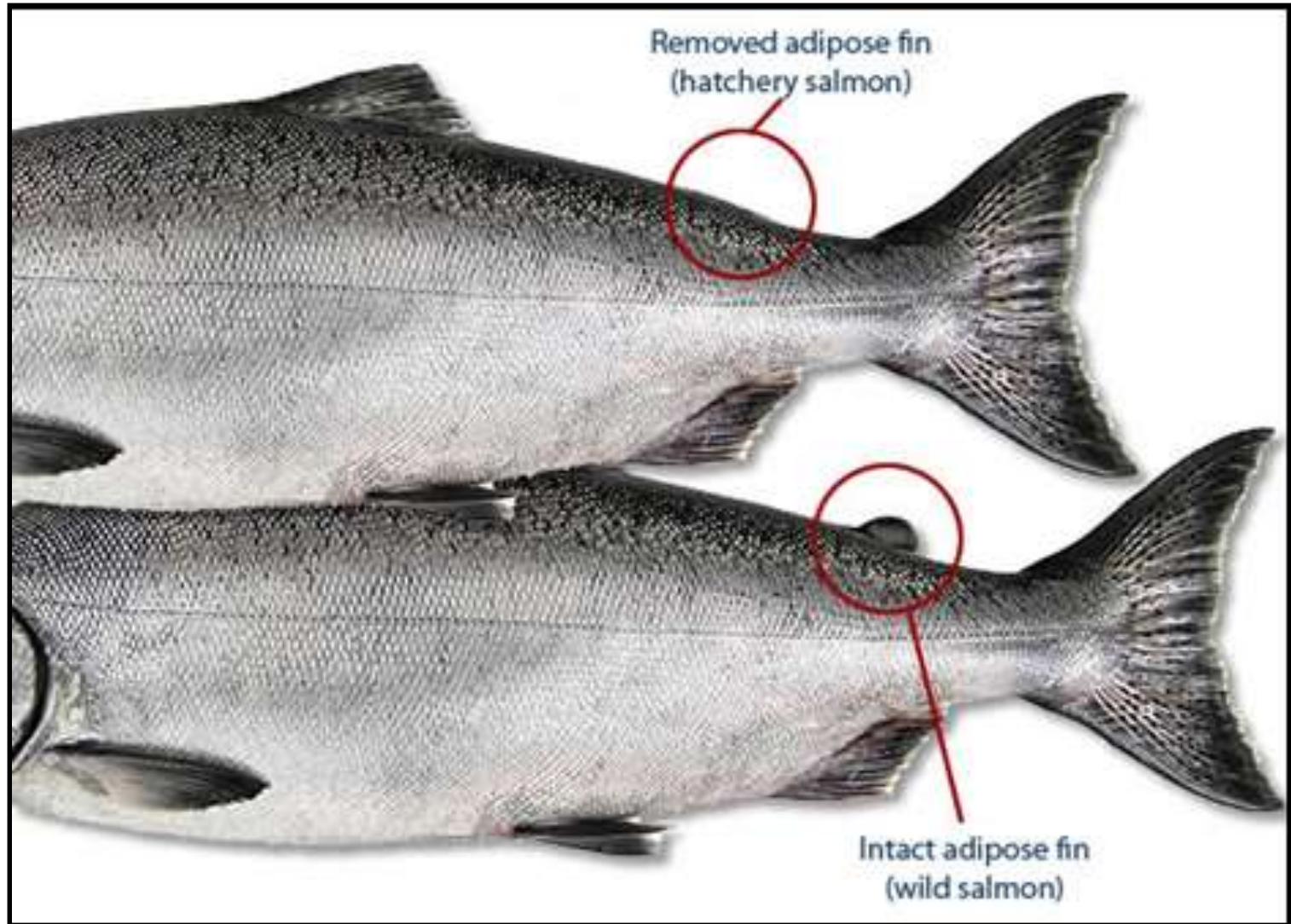


Hatchery-reared salmon



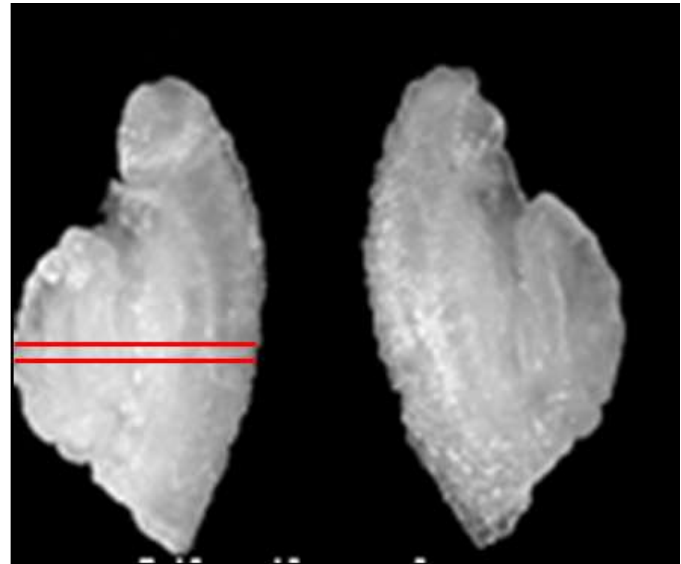
Wild salmon (stream type)

MARKING TECHNIQUES



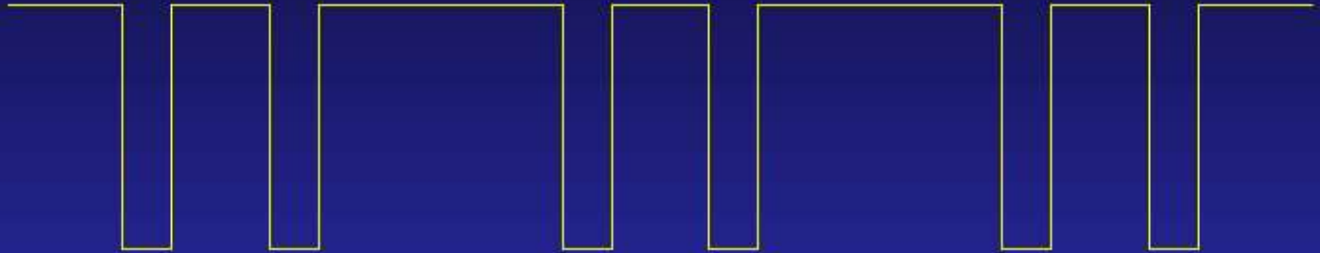
RESEARCH & MONITORING TECHNIQUES

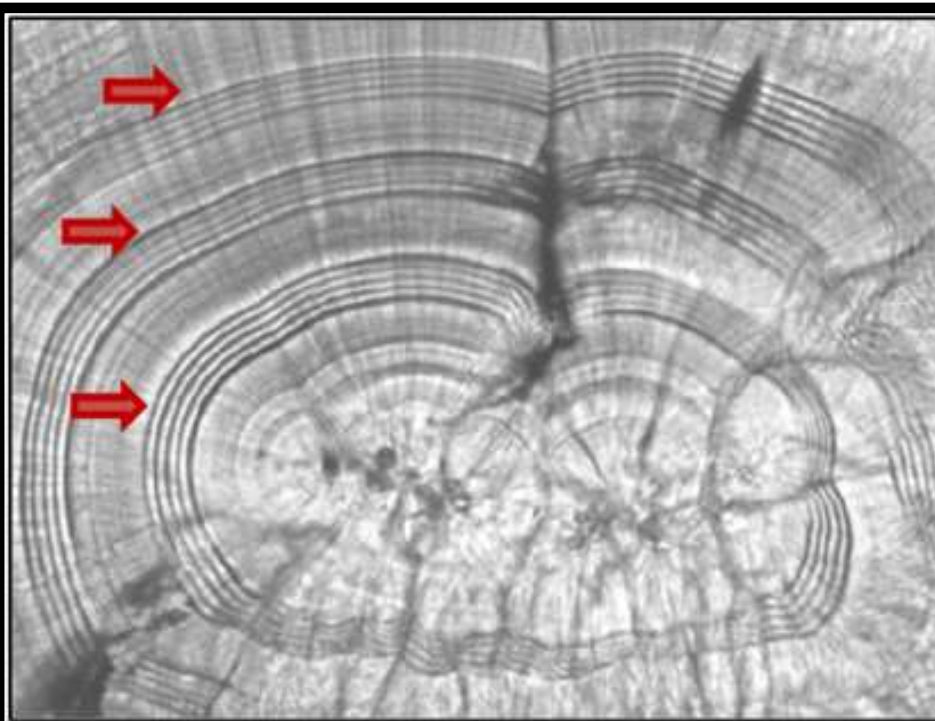
- monitoring wild salmon populations and salmon enhancement programmes using fish ear bones (otoliths)



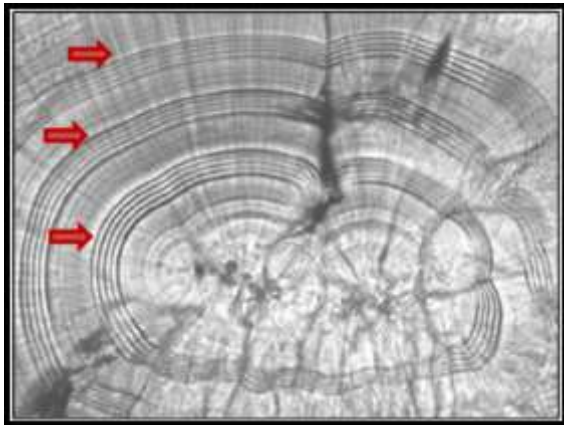
Mass marking techniques:

Thermal marking of otoliths





Example of a thermally marked Chinook salmon (*Oncorhynchus tshawytscha*) otolith. There are three distinct series (red arrows) of five marking events. Each marking event is caused by exposure to 8 hours of cool and 16 hours of background water temperature (from Volk *et al.* 2004).

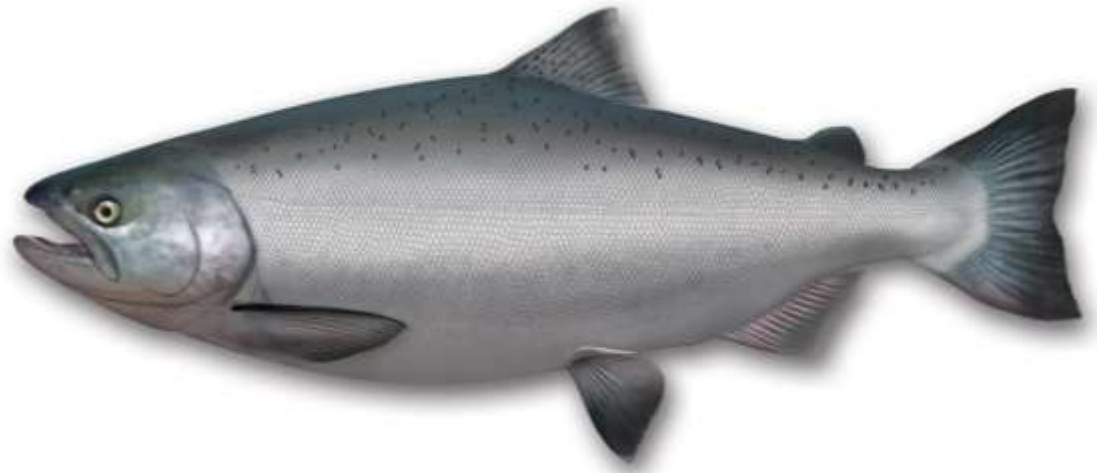


NZ CHINOOK SALMON SMOLT RELEASE STRATEGIES

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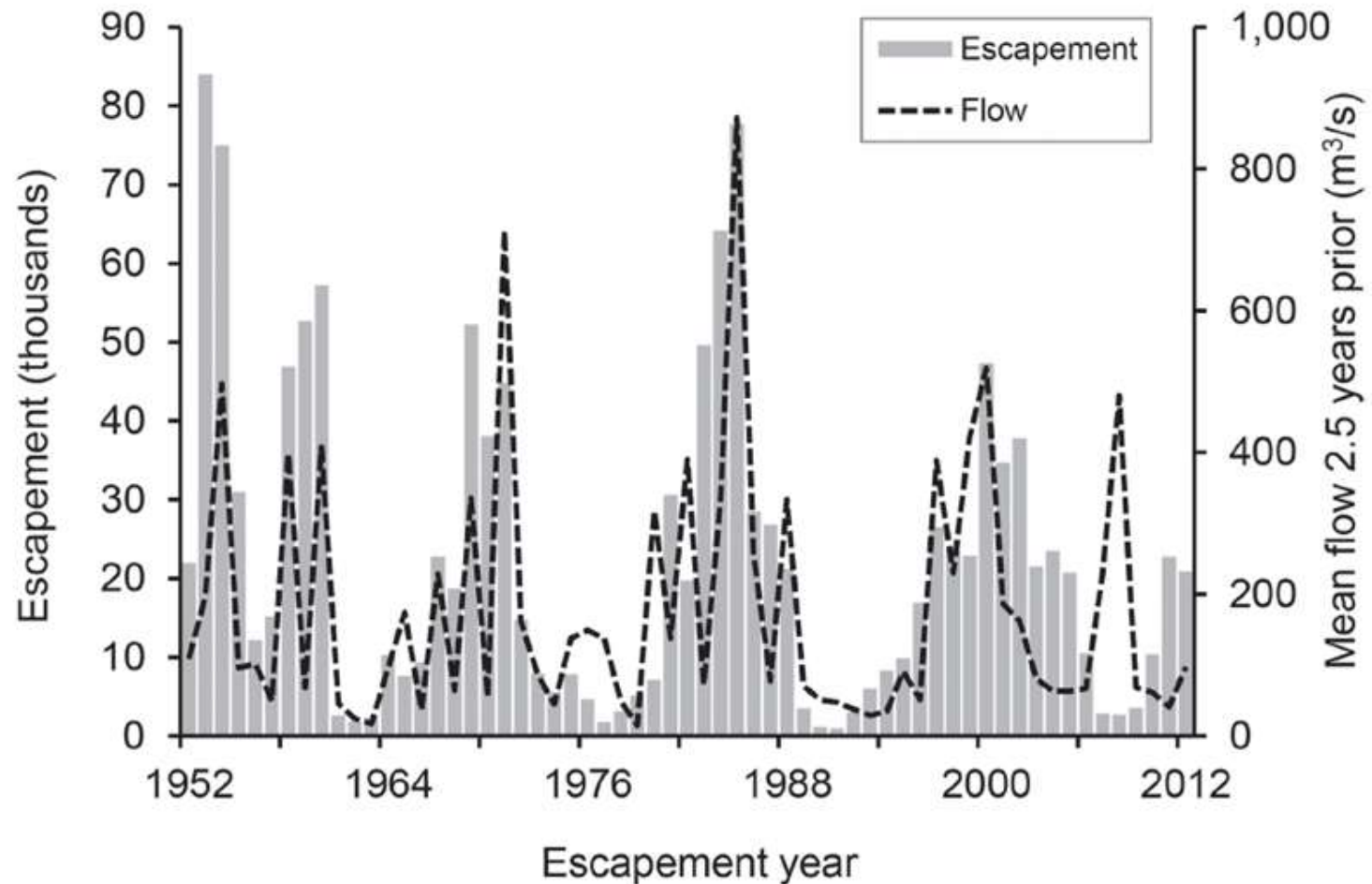
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Sacramento vs. New Zealand



ENVIRONMENTAL ISSUES – THE IMPORTANCE OF RIVER FLOWS



Source: Sturrock et al 2016: Reconstructing the Migratory Behavior and Long-Term Survivorship of Juvenile Chinook Salmon under Contrasting Hydrologic Regimes. **PLoS ONE**

RECOMMENDATIONS FOR THE FUTURE:

Enhancement programmes will benefit from monitoring:

- Survival of hatchery-reared salmon smolt, and eggs placed in stream incubators
- Age structure of recreational harvest, and returning hatchery-reared or wild spawning adults
- Proportion of hatchery vs wild origin salmon in angler catch / harvest
- Proportion of wild vs hatchery origin salmon on the natural spawning grounds (is mixing of hatchery & wild fish common?)



Thank you!



rasmus.gabrielsson@cawthron.org.nz

