

Length of Atlantic salmon smolt and their subsequent marine survival



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Introduction

- Atlantic salmon numbers have declined dramatically since late 1980's
- A widespread view is that the decline was triggered by a change at sea
- Populations in Northern & Southern NEAC countries continue to decline
- Evidence is emerging that the decline might be related to changes in the freshwater
- See Russell et al. 2012, ICES J Mar Sci 69: 1563-1573



Objectives

- To develop and test a Bayesian State-Space model quantifying:
 - Atlantic salmon smolt -> spawner marine survival (ϕ_{sm})
 - The effect of smolt size on their subsequent marine survival
- Apply the model to data collected on the river Frome, Dorset, UK

Next steps

- To extend the model to other:
 - rivers and populations
 - stressors; competing hypotheses

Methods

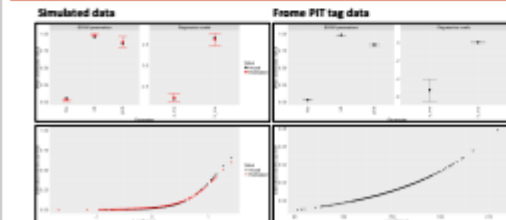
- Estimate marine survival with Bayesian State-Space model
- Adapt BSSM to estimate effect of individual smolt length:

$$\phi_{sm} = \frac{1}{1 + \exp(-\beta \cdot L)} \cdot \alpha + \beta \cdot \text{length}$$
- Simulate data, fit model, measure bias in recovered est's
- Fit model to PIT tag data collected on river Frome, Dorset

Frome PIT tag data: 2003 - ongoing, approx. 30,000 PIT tag parr -> adult capture histories

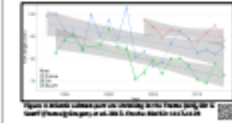


Results



Conclusions

- Our results suggest that longer smolt have higher marine survival:
 - From 1% @ 133mm to 5% @ 149mm
- Implication for Atlantic salmon population management; parr are shrinking!

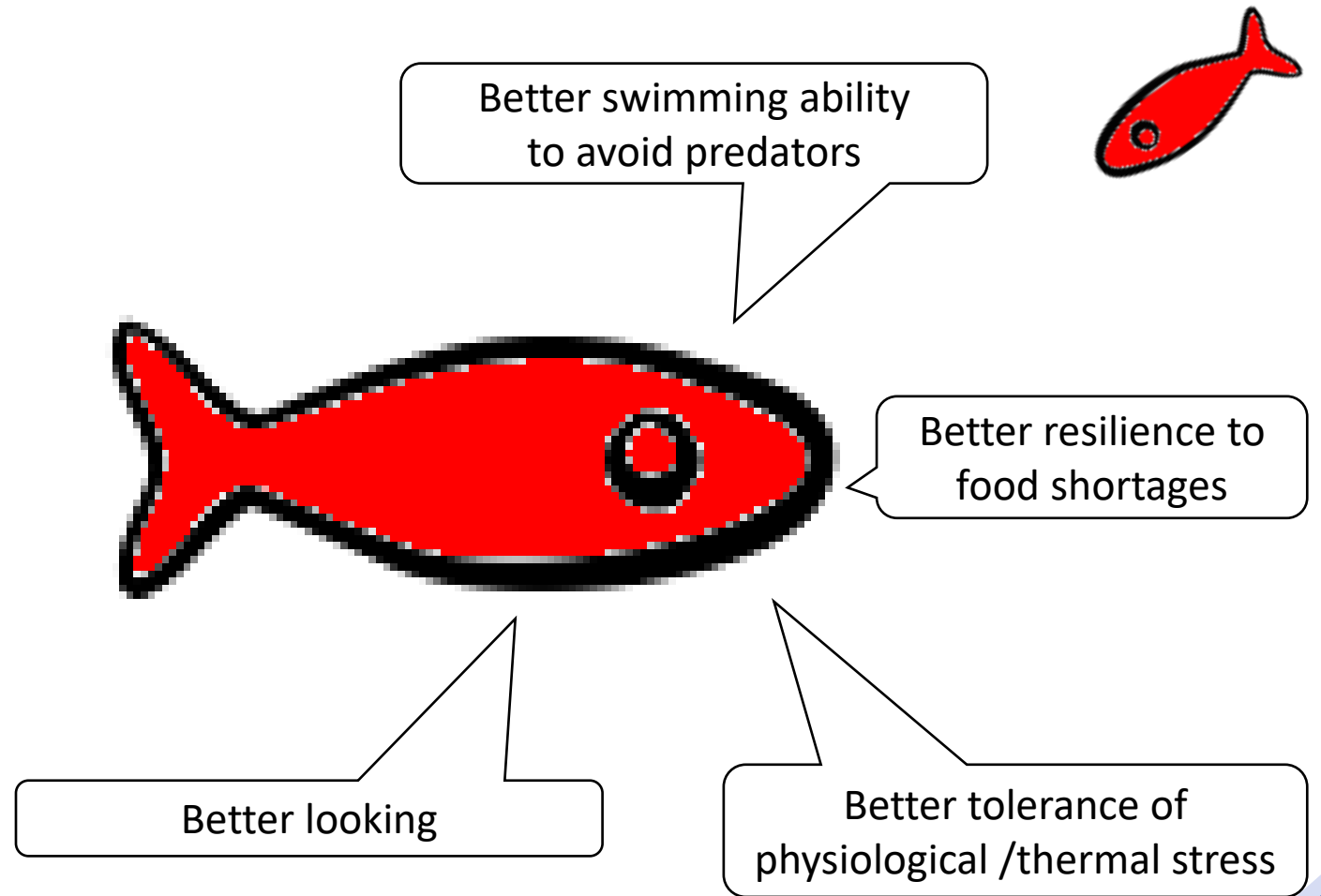
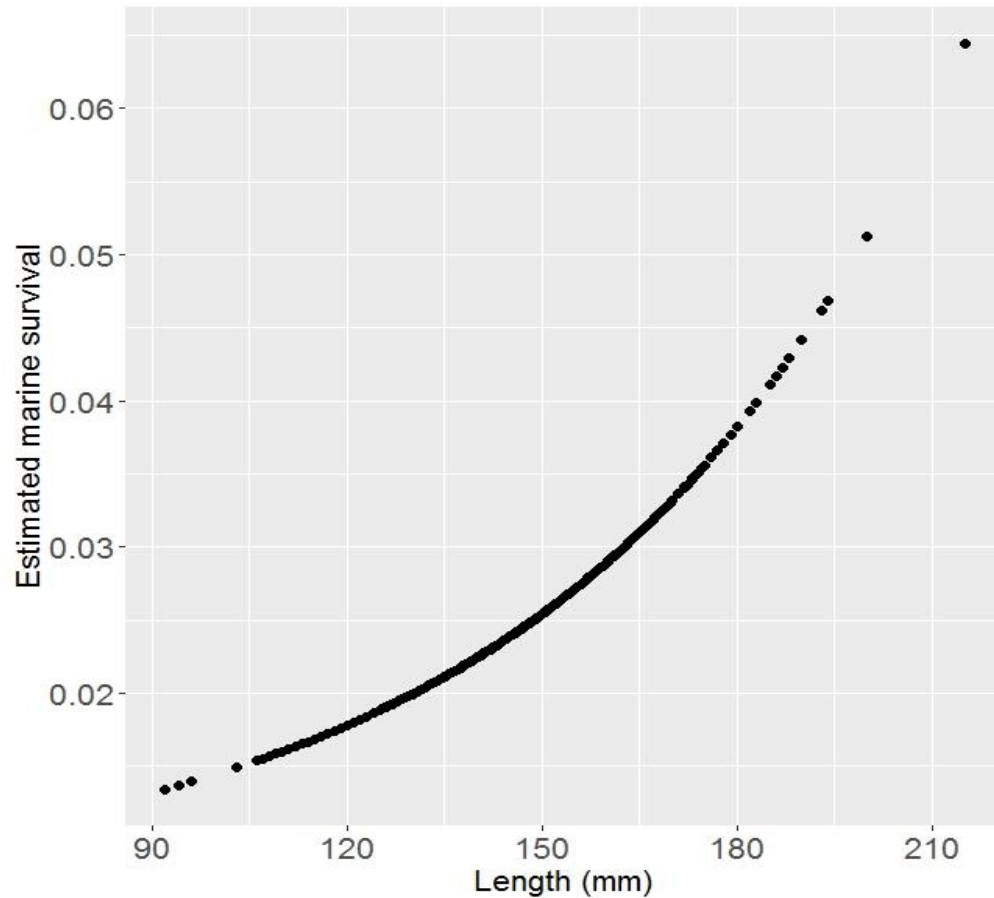


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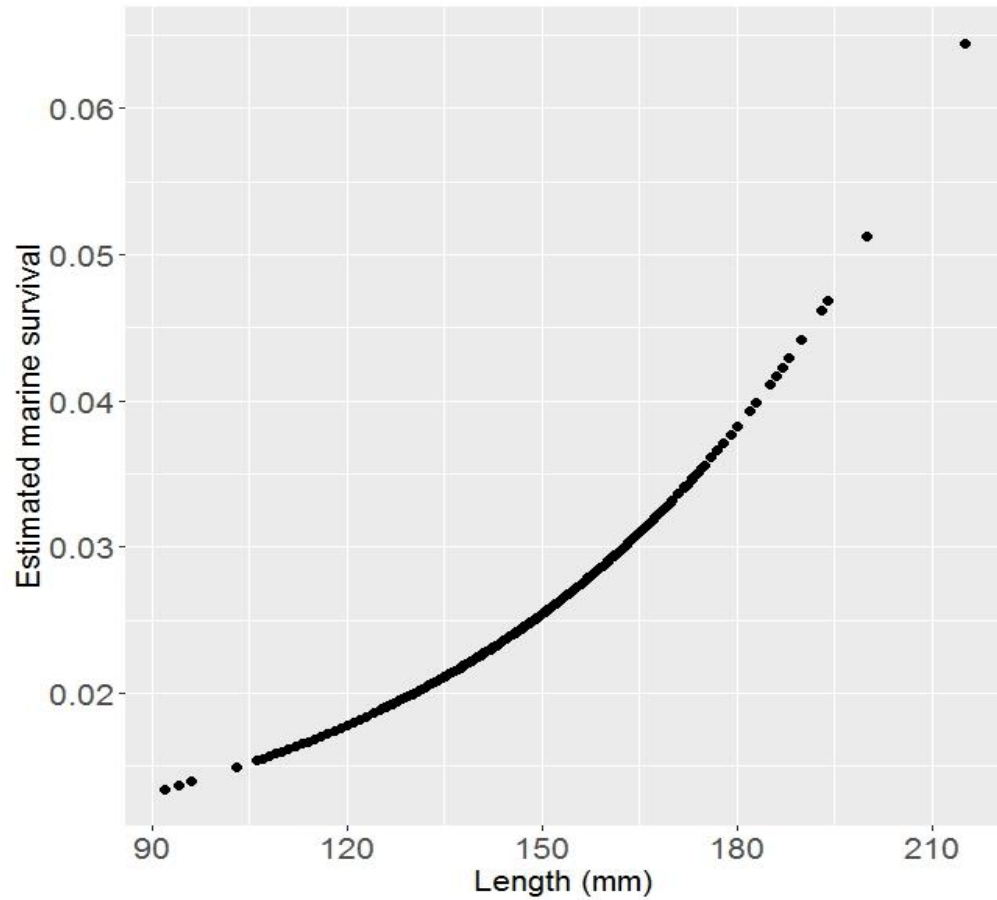
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populations migration estimates
bayesian survival
number sample parr decline adult
salmon model
dorset bias subsequent
collected effect atlantic length river
frome pittag fit estimate year
values individual 10000 data marine
recording shrinking simulated generating parameter
smolt

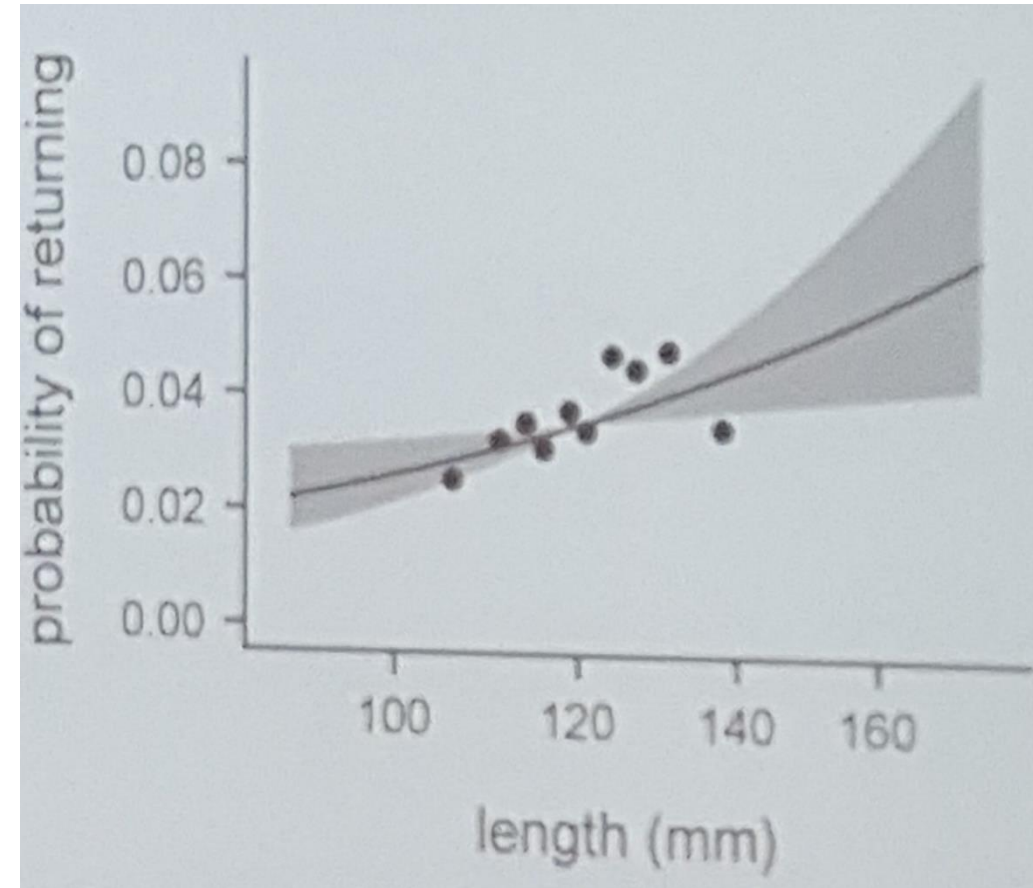
Bigger is better



Collaboration

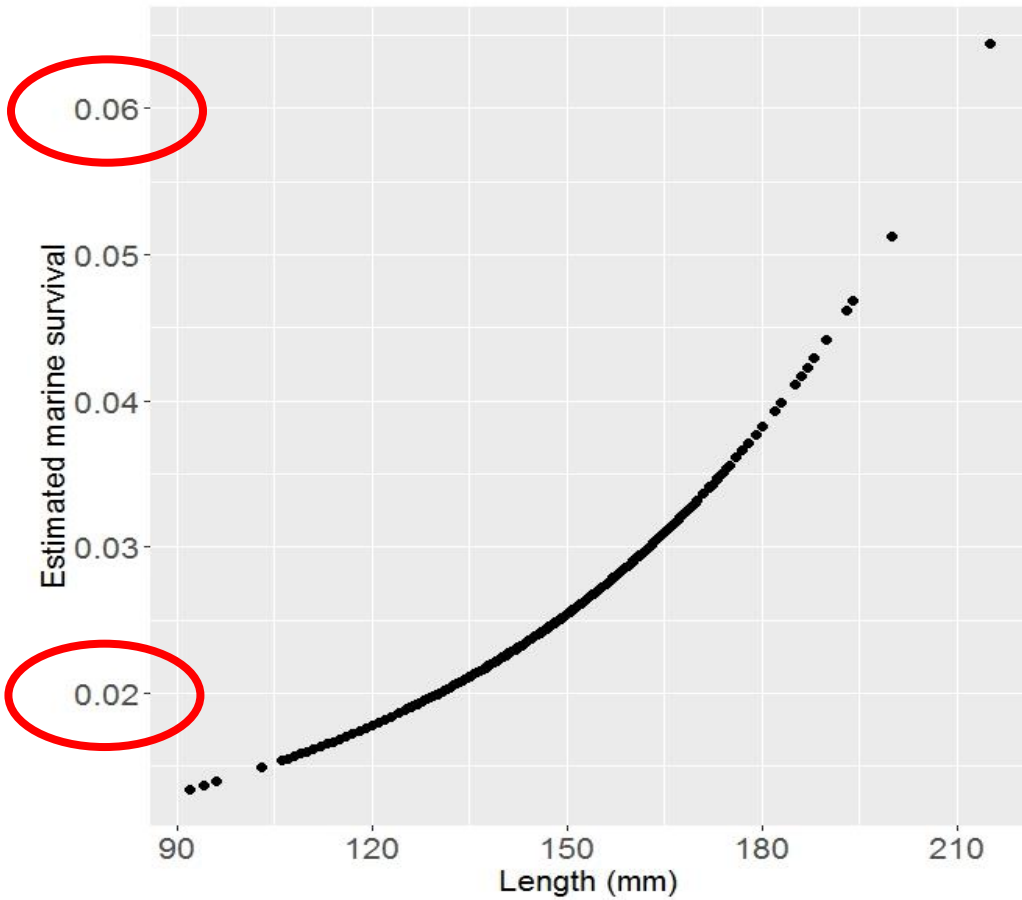


Gregory et al.

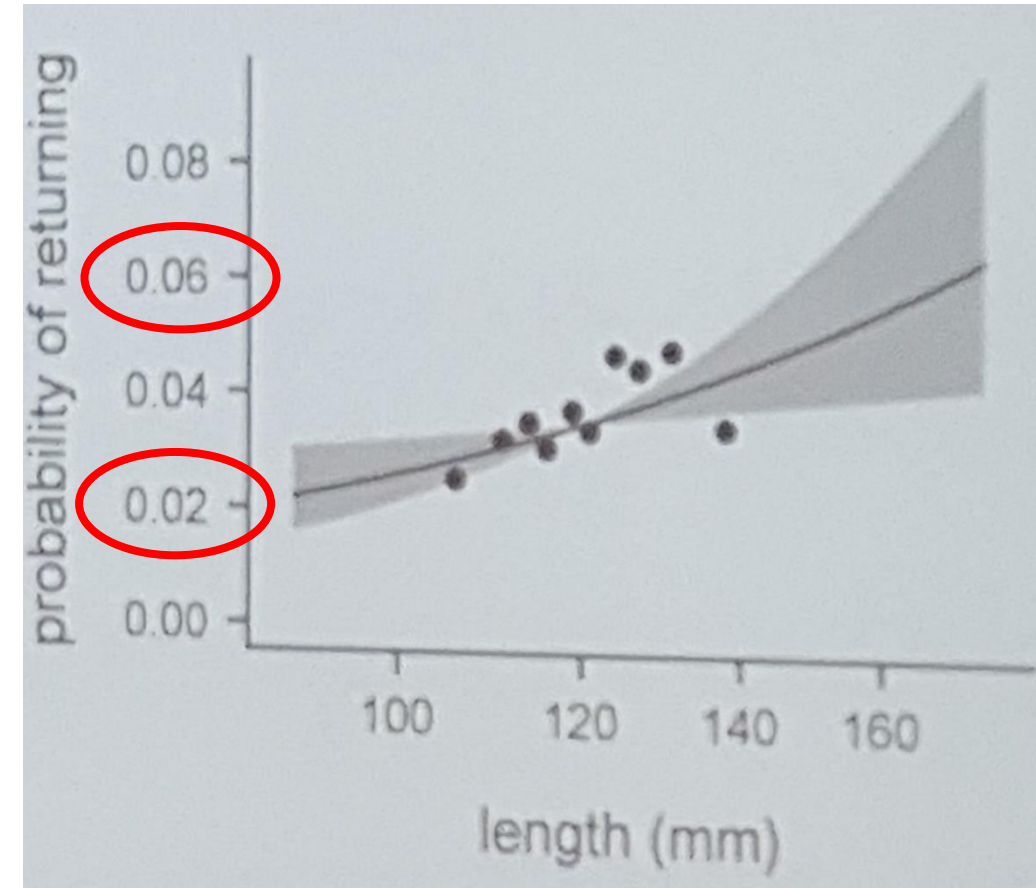


Armstrong et al.

Collaboration

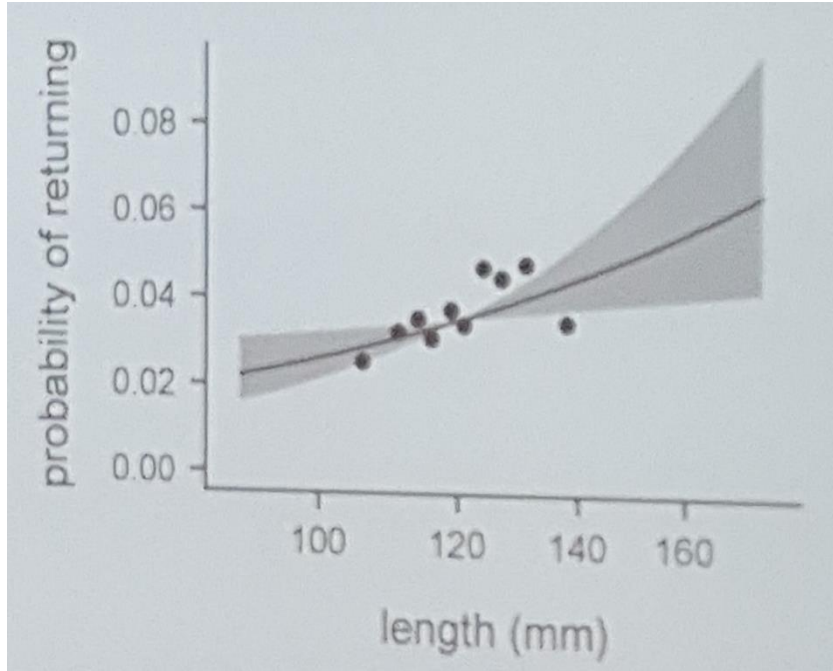


Gregory et al.

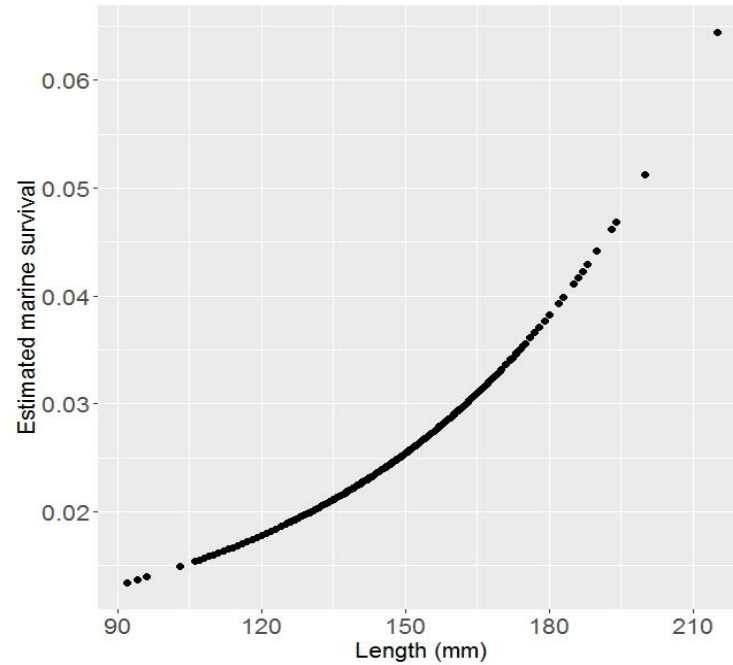


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Collaboration

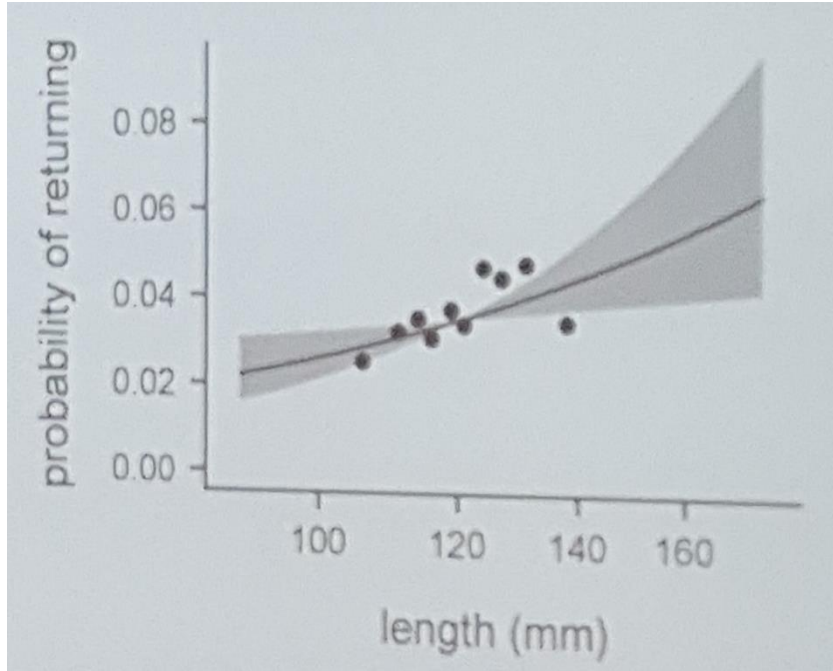


Armstrong et al.

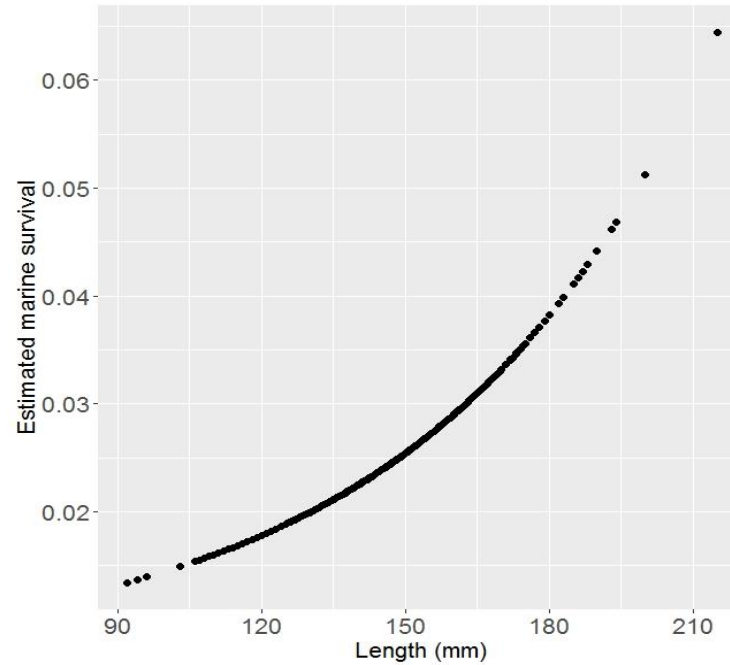


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Collaboration



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