**A SIMPLE MODEL USED TO ASSESS EFFECTIVENESS OF IPNV CONTROL STRATEGIES FOR SCOTTISH SALMON FARMS**

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**What is IPNV?**

- Infectious Pancreatic Necrosis is disease of farmed fish, especially salmonids
- Caused by the aquabirnavirus IPNV
- IPNV is sometime found in wild fish (but not IPN)
- IPNV is spreading in range and becoming more common
- We present a model to describe spread in Scotland

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**Model Scenarios Predicting Effects of Interventions**

- Marine transmission cut 50%
  - Control ineffective
- Source of smolt per marine farm cut from 3 to 1
  - Control ineffective
- Freshwater transmission cut 50%
  - Partially effective
- All 3 cuts
  - Effective control

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**Salmon production is increasing**

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**Conclusion**

- Simple model describes IPNV’s emergence
- Predicts prevalence equilibrates at 90% marine, 40-50% freshwater
- Improvements required everywhere for eradication

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**Model Approach**

- SI Model \( I = \text{proportion farms infected}, \ S + I = 1 \)
- Freshwater and Marine Phases
- Marine farms receive fish from several freshwater farms, if any of these infected the marine farm is infected
- Transmission \( m_y \) \( \text{SI} \) \( m_y = \text{population factor} \)
- Infection remains until fish harvested

**Freshwater model**

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\begin{align*}
\frac{dS_f}{dt} &= s - m_y b_y S_f I_f - s S_f \\
\frac{dI_f}{dt} &= s - m_y b_y S_f I_f - s I_f
\end{align*}
\]

**Marine model**

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\begin{align*}
\frac{dS_m}{dt} &= h X - m_y b_m S_m I_m - h S_m \\
\frac{dI_m}{dt} &= h (1 - X) + m_y b_m S_m I_m - h I_m
\end{align*}
\]

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