A movement model to assess management performance for transboundary stocks

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Can we identify management procedures that are robust to migration variability?
From: Agostini et al. 2006
Modeling migration
• Lagrangian movement model:
  • continuous in time and space
  • age/size structured movement
  • allow for movement variability:
    abundance and environmentally driven

• Can be fit to data: spatial age composition
Lagrangian movement model - fish movement

\[ \tilde{X} = X_{\text{min}} + (X_{\text{max}} - X_{\text{min}}) \cdot \left(0.5 + 0.5 \times \sin \left(t \cdot \frac{2\pi}{T} - t_0 \cdot \frac{2\pi}{T}\right)\right) \]

\[ \text{pos}_{a,x,t} \sim \mathcal{N}(\tilde{X}, \sigma) \]
Lagrangian movement model - Fishing effort

- Gravity model for effort distribution
- Higher fishing effort in areas with observed high abundance
- Areas with low likelihood of fishing (distance, bycatch)
Migration changes with abundance
Migration changes with environmental changes
Next steps:

- Evaluate how different movement scenarios impact management outcomes
- Identify management procedures that mitigate unexpected impacts of movement variability
Thank you!