

# Predicting the cumulative effects of multiple stressors on shellfish ecosystem service provision



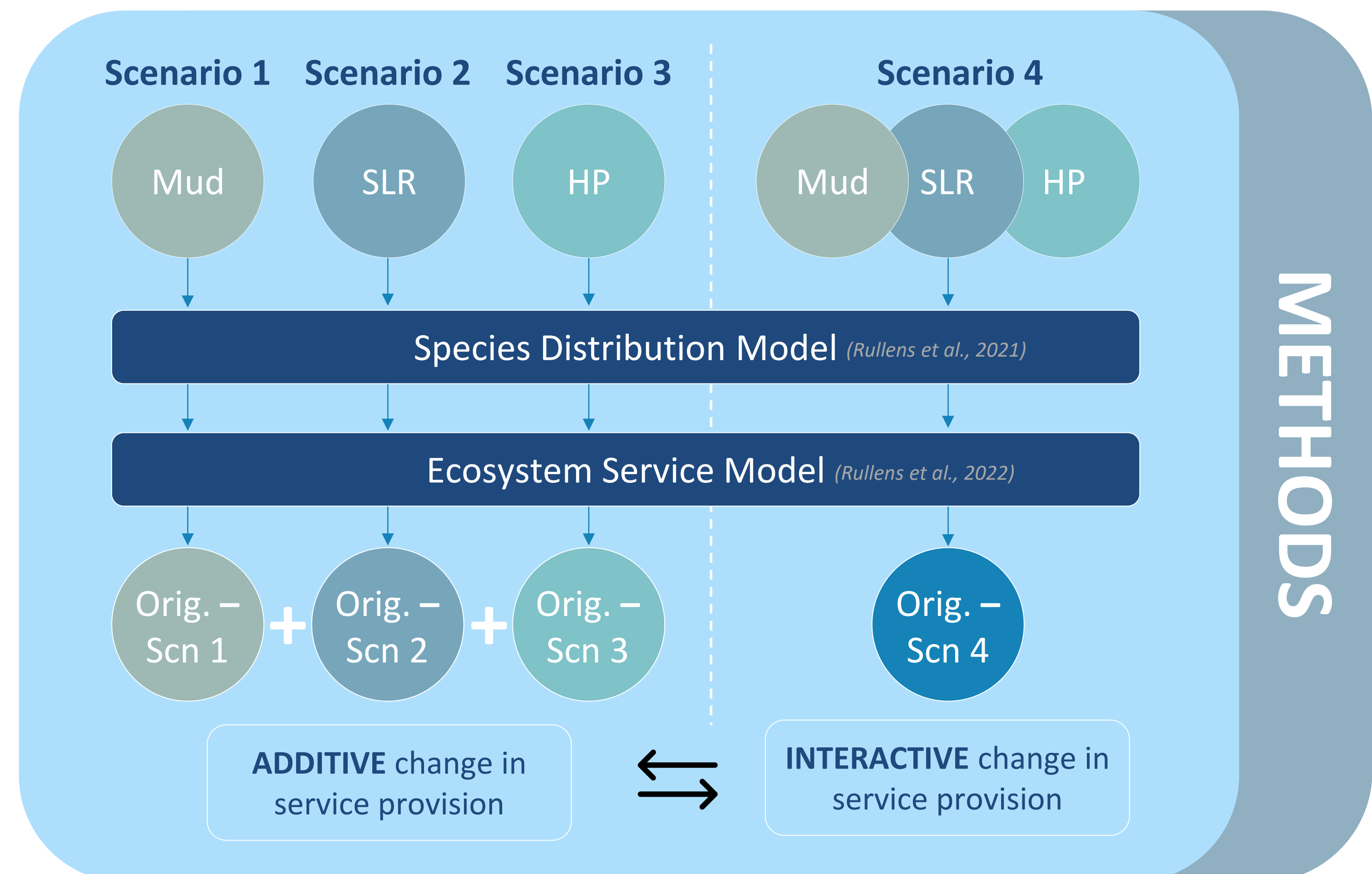
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## BACKGROUND

- Estuarine ecosystems are increasingly subject to an array of stressors affecting their health, functionality and capacity to provide the goods and services (ES) on which society relies.
- Important service providers such as shellfish are under threat from stressors including sedimentation (Mud), sea level rise (SLR) and harvesting pressure (HP).
- Concern and uncertainty surrounds the potential for the interactive effects of multiple stressors to be greater (synergistic) or less (antagonistic) than their additive effect.
- The integration of modelling approaches enables assessment of responses across broader spatial and temporal gradients of stressors.

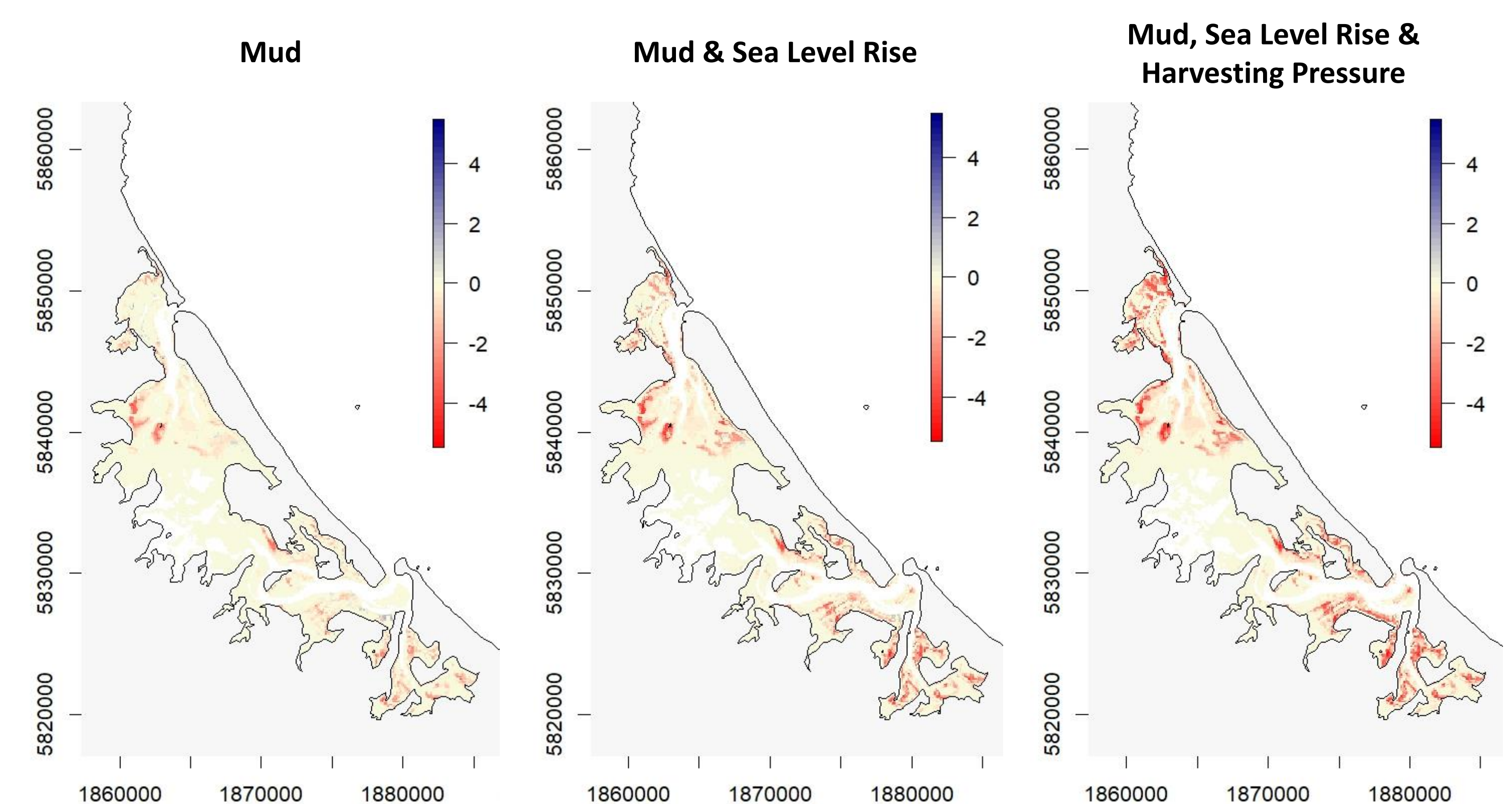
**Q:** How do the cumulative effects of multiple stressors influence shellfish density and associated ecosystem service potential?

## METHODS

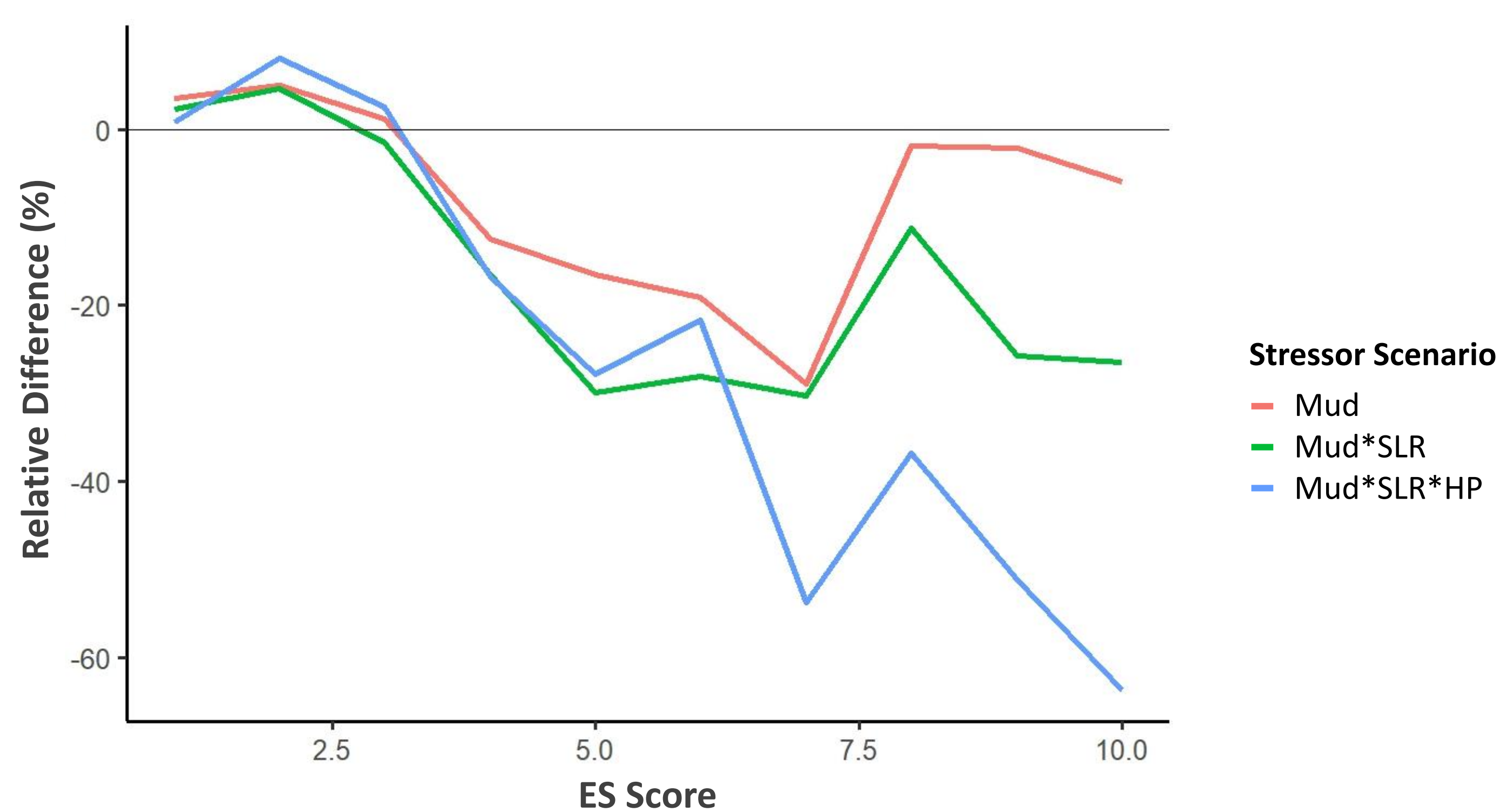


## PRELIMINARY RESULTS

- Small increases in single and cumulative stressors were found to cause substantial changes to bivalve density and their distribution.
- This could have both positive and negative impacts on ES due to shifts in optimal environmental conditions.
- Stressor effects varied spatially with some areas more heavily impacted than others (Figure 1).
- There was an overall reduction of high ES areas whilst increasing areas of low ES potential (Figure 2).



**Figure 1.** Effects of stressor scenarios on food provision service scores for *Austrovenus stutchburyi* in Tauranga Harbour with positive and negative values representing an increase and decrease in service score/provision respectively.



**Figure 2.** Differences (%) in ES score frequency under each stressor scenario for the food provision service by *Austrovenus stutchburyi* relative to the original/baseline ES predictions.

## APPLICATIONS

- Impact assessment
- Decision & policy making
- Conservation & restoration
- Scenario testing
- Identify vulnerable areas
- Reduce risk & uncertainty
- Enhance communication
- Prioritise stressor &/or ES

This research is associated with the “Risk and Uncertainty Project”