Appendix C: Supplementary figures

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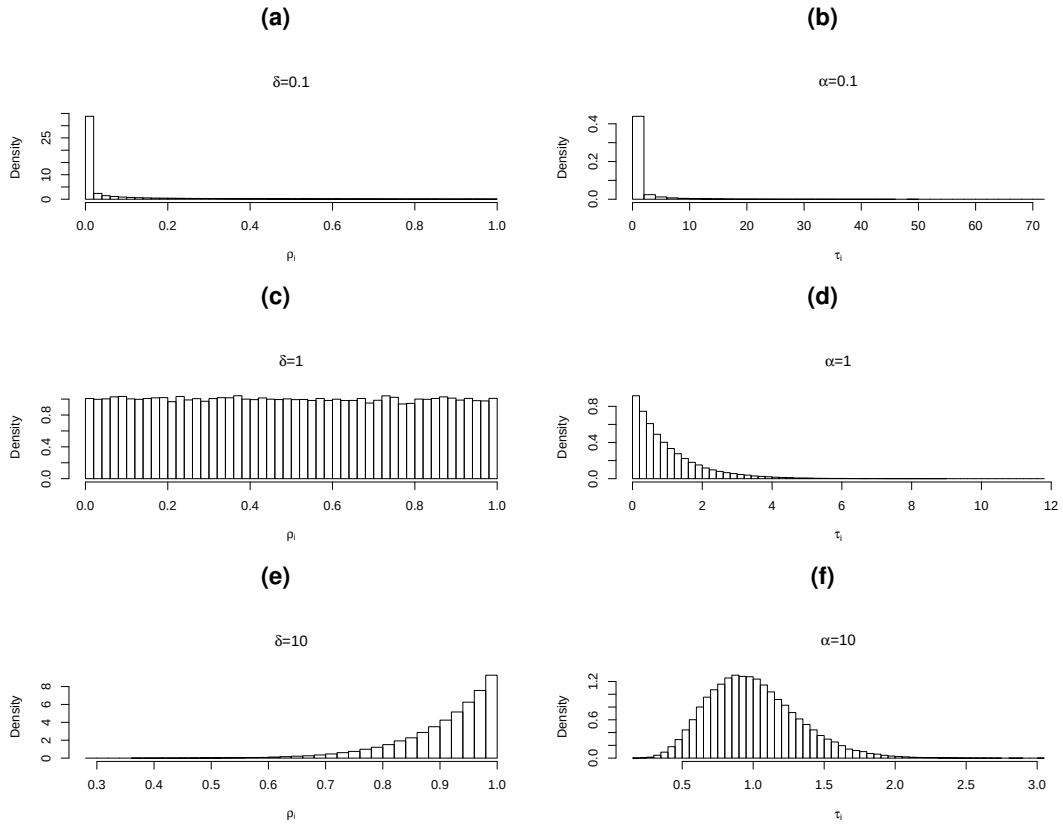

Figure C-1. Illustrations for the Beta prior for ρ_i (model line 5; a,c,e) and the Gamma prior for τ_i (model line 4;c,d,f) in the state-space model under different realisations of the hyper-priors δ and α, respectively. Larger estimated values of δ are associated with higher auto-correlation at all beaches (i.e., higher overall ρ_i). Larger values of α lead to higher variability in volatility (i.e., year-to-year variation) among beaches.

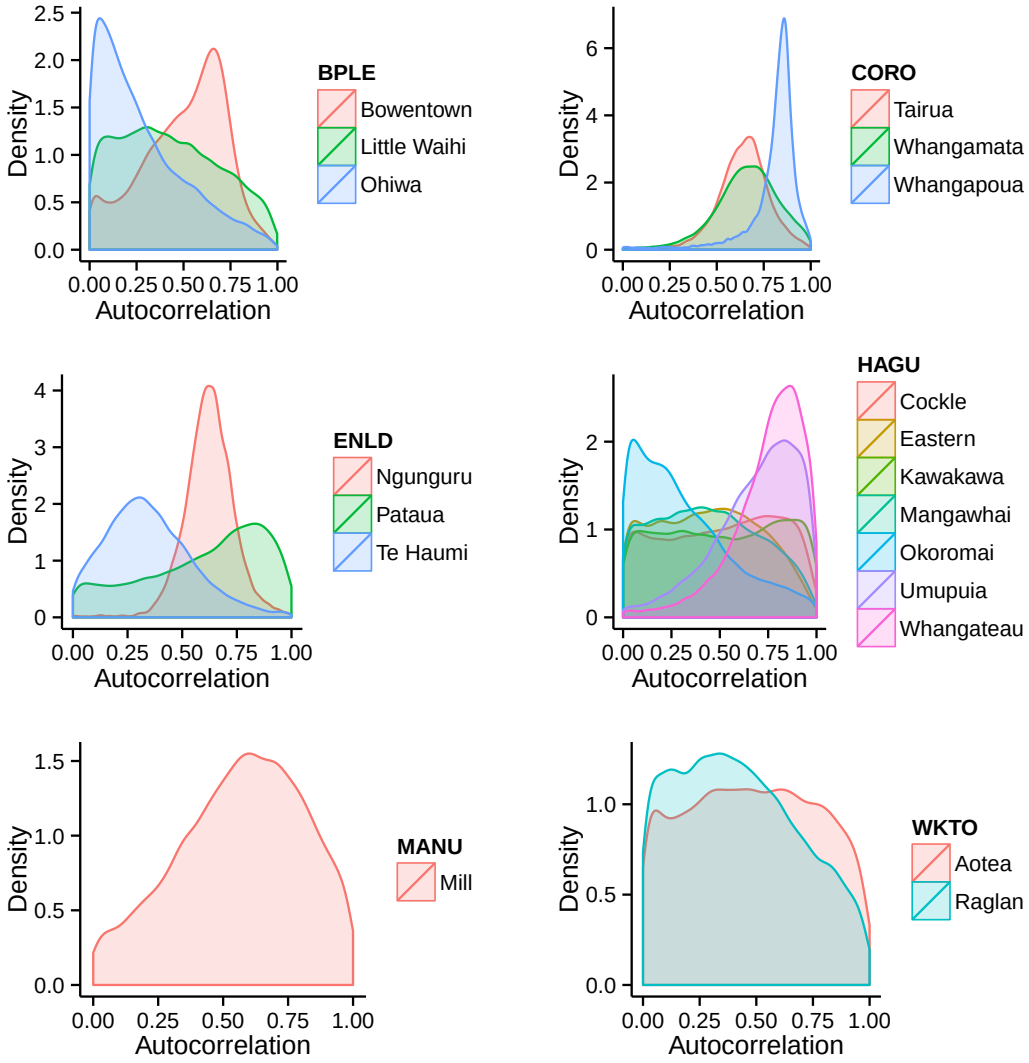

Figure C-2. Posterior density estimates for the auto-correlation parameter ρ at each site. Increasing values of ρ suggest more correlated time-series. Abbreviations indicate regions, including BPLE: Bay of Plenty, CORO: Coromandel Peninsula, ENLD: Eastern Northland, HAGU: Hauraki Gulf, MANU: Manukau Harbour, WKTO: Waikato.

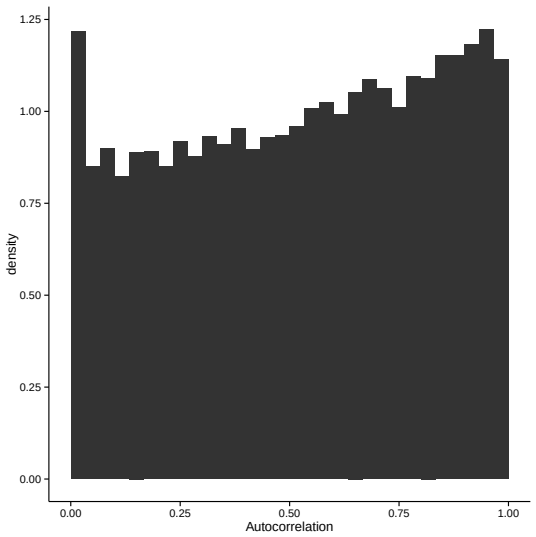

Figure C-3. Posterior predictive distribution for the auto-correlation parameter ρ, giving the distribution over potential ρ values at un-observed sites. Increasing values of ρ suggest more correlated time-series.

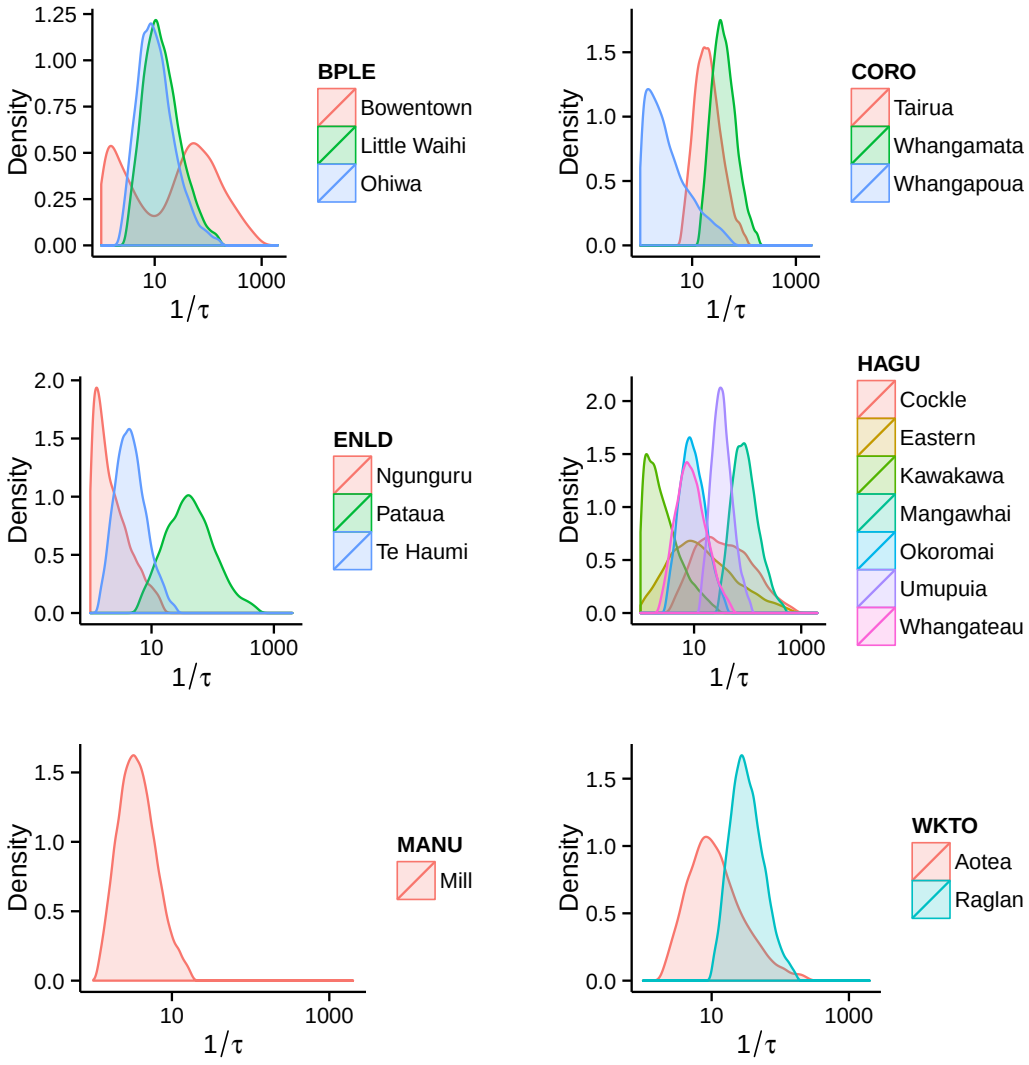

Figure C-4. Posterior density estimates for the volatility parameter $1/\tau$ at each site. Increasing values of $1/\tau$ indicate higher volatility in the time-series. Abbreviations indicate regions, including BPLE: Bay of Plenty, CORO: Coromandel Peninsula, ENLD: Eastern Northland, HAGU: Hauraki Gulf, MANU: Manukau Harbour, WKTO: Waikato.

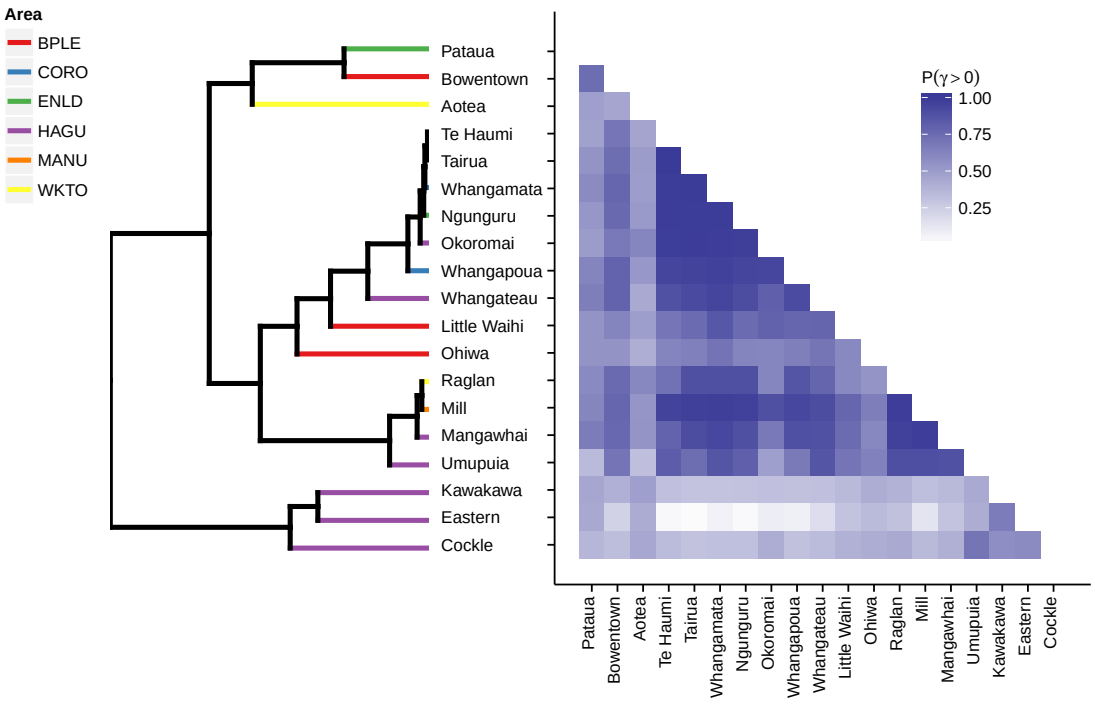

Figure C-5. Posterior probability that the cross-correlation among estimated cockle density time-series at all sites is strictly positive. The tree is based on hierarchical (complete linkage) clustering of this probability (transformed to distance using $d_{i,j} = (1 - \gamma_{i,j})/2$), with branch colours representing regions (BPLE: Bay of Plenty, CORO: Coromandel Peninsula, ENLD: Eastern Northland, HAGU: Hauraki Gulf, MANU: Manukau Harbour, WKTO: Waikato).

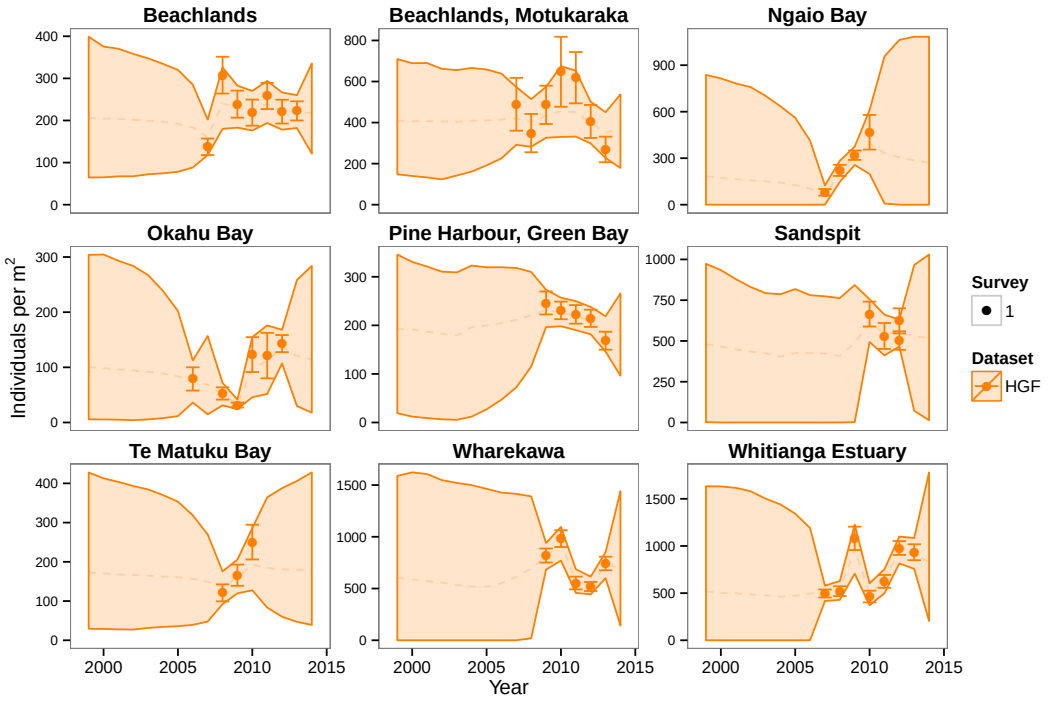

Figure C-6. Estimated trends (dashed lines) of total cockle densities (per m^2) at sites surveyed by both the Auckland Intertidal Surveys and the Hauraki Gulf Forum community shellfish monitoring programme (colours indicate survey programme), using a Bayesian auto-regressive model. Points and intervals show individual survey estimates and their associated standard deviations. The underlying trend was assumed to be identical between surveys series at any beach, but offset by a constant between survey series.