



**Figure 5.** a.) Mean nonlinear response curves showing the relationship between giant kelp canopy biomass and seawater nitrate concentration for the two populations, shaded areas show standard error. b.) Mean annual seawater nitrate time series for the two populations, shaded areas show 95% confidence intervals. c.) Map of the coastline of California showing the geographic clustering of each coastline segment's response curve to nitrate concentration using a kmeans clustering analysis.