**Abstract**

Global biodiversity declines associated with anthropogenic stressors have motivated researchers to implement monitoring programs to estimate species richness for major taxonomic groups. Due to logistical challenges of species identification, there have been efforts to use biological and abiotic surrogates as indicators of species richness targets. An effective surrogate has two essential features: first, it takes less time, money, and experience to measure than the target and second, it maintains a consistently strong correlation with the target over space and time. Few studies, however, have explicitly investigated surrogate effectiveness over time, and those that have are typically quite short. Our main aim was thus to study how surrogate-target relationships vary in space and time, with a particular emphasis on multi-decadal temporal changes. We used coral reefs as a study system because they support high biodiversity and have been strongly affected globally over the past several decades by natural and anthropogenic stressors. Coral reef assessments have primarily focused on monitoring species richness of fish and hard corals due to the ecological and economical value of these taxonomic groups. The species richness of these conspicuous, well-studied taxonomic groups has been extrapolated to represent the richness of other coral reef taxa or to represent total species richness of coral reefs. However, the reliability of these extrapolations is not well-studied, and we used sponges as a case study to assess whether surrogates for fish and coral species richness can be used to predict the richness of other groups. We selected two simple biotic surrogates (total coral cover and total sponge cover) and one abiotic surrogate (reef rugosity) to predict richness of corals, fish, sponges, and richness of the three groups pooled. To study how these surrogate-target relationships vary over time and space we used 27 years of monitoring data from eight sites around Guana Island in the British Virgin Islands. Our first objective was to determine which of three candidate surrogates (coral cover, sponge cover, rugosity) was most strongly correlated with each of four separate targets (species richness of corals, fishes, sponges, and richness of the three groups pooled). To address this objective, we compared a set of simple models of each of the candidate surrogates as predictors using AICc. We found that, of our candidate surrogates, coral cover was the best surrogate for coral and sponge richness and rugosity was the best surrogate for fish richness and richness of the three groups pooled. Our second objective was to determine if the relationships between the surrogate and corresponding target remain consistent among sites and, most importantly, are stable over time. For this objective, we compared models of the best surrogate as a predictor with additional terms to account for change over the duration of the study and variation across sites using AICc. We found that coral cover was a stable surrogate for coral richness because the rankings of species richness among sites were consistent over time. The coral cover- sponge richness relationship was weak and was of limited quantitative predictive ability across both space and time. Rugosity was a relatively poor spatial surrogate for fish richness but, at any given site, temporal changes in the rugosity-fish richness relationship were comparatively minor. The surrogate-target relationship between rugosity and richness of the three groups pooled was qualitatively stable because simple rankings of species richness among sites are expected to remain consistent over time. Notably, we found that surrogate-target relationships for coral and sponge richness changed quantitatively over the 27 years of the study. For both targets, using the initial surrogate-target relationship to extrapolate over time would have resulted in a steadily increasing underestimate of species richness. All of the surrogates tested were qualitatively stable over time in the sense that rankings of species richness among sites were consistent over nearly three decades. Our findings suggest that monitoring of cost-effective surrogates is appropriate in tracking changes in the relative species richness of coral reef communities and that priority areas selected using a one-off spatial survey are likely to retain the features that made them priority areas.