Evaluating and projecting spatio-temporal changes in reef-building coral diversity

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Both global-scale (climate change) and local-scale (land-based pollution) have been causing significant change on corals. Japan provides an ideal setting to examine these changes, because it covers a wide latitudinal range, stretching from subtropical to temperate areas. This means that Japan provides a unique opportunity for examining baselines of species range shifts and/or expansions due to climatic warming over a large spatial scale. In addition, some islands have significant amount of sediment discharge through rivers as a result of extensive land development. So land-based pollution issues can be examined.
We collected records of coral species occurrence since 1930s. After careful examination of the species distribution, we detected four species showed range expansions. Annual variability of winter SST reconstructed the range expansions using histrically calculated SSTs by climate models. On the other hand, southern Japan, coral bleaching events were driven by anomalously high SSTs in summer. Further, poor recovery after the bleaching was observed at sites that suffer from terrestrial red-soil runoff. Future projection of coral habitats based on these results and climate model outputs suggests the importance of reducing CO_2 emission for conservation of corals. In addition, important marine areas for coral conservation was detected by using the EBSA criteria. These results would contribute to adaptation planning to climate change (e.g., reducing red-soil runoff, designating protected areas, etc.).

