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Effects of rising sea surface temperature and ocean acidification on corals

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Increasing atmospheric CO₂ concentration is considered to change distribution of corals in various ways via global warming and ocean acidification. For example, poleward range expansion of coral habitats is caused by rising sea surface temperature in response to global warming. On the other hand, lower saturation fraction of aragonite due to ocean acidification is presumably prominent with lower sea surface temperatures in higher latitudes. Therefore, the future distribution of coral habitats is considered to be determined by the net effects of global warming and ocean acidification. In this study, using climate model results cited in the IPCC 4th Assessment Report along with simplified indicators for coral habitats, we estimated future potential effects of global warming and ocean acidification on coral distributions in seas close to Japan. The model results suggest that the coral habitats will be strongly controlled by the poleward range expansion by rising sea surface temperature and the equatorward range expansion by ocean acidification at the same time, and that the effects will appear earlier, by the middle of the 21st century, than estimated in previous studies.

Keywords: global warming, ocean acidification, corals, climate model, simplified indicator