ID: W2106748737

TITLE: Ocean acidification limits temperature-induced poleward expansion of coral habitats around Japan

AUTHOR: ['Yumiko Yara', 'Meike Vogt', 'Masahiko Fujii', 'H. Yamano', 'Claudine Hauri', 'M. Steinacher', 'Nicolas Gruber', 'Nicolas Gruber']

ABSTRACT:

Abstract. Using results from four coupled global carbon cycle-climate models combined with in situ observations, we estimate the effects of future global warming and ocean acidification on potential habitats for tropical/subtropical and temperate coral communities in the seas around Japan. The suitability of coral habitats is classified on the basis of the currently observed regional ranges for temperature and saturation states with regard to aragonite (Ω_{arag}). We find that, under the "business as usual" SRES A2 scenario, coral habitats are projected to expand northward by several hundred kilometers by the end of this century. At the same time, coral habitats are projected to become sandwiched between regions where the frequency of coral bleaching will increase, and regions where Ω_{arag} will become too low to support sufficiently high calcification rates. As a result, the habitat suitable for tropical/subtropical corals around Japan may be reduced by half by the 2020s to 2030s, and is projected to disappear by the 2030s to 2040s. The habitat suitable for the temperate coral communities is also projected to decrease, although at a less pronounced rate, due to the higher tolerance of temperate corals for low Ω_{arag}. Our study has two important caveats: first, it does not consider the potential adaptation of the coral communities, which would permit them to colonize habitats that are outside their current range. Second, it also does not consider whether or not coral communities can migrate quickly enough to actually occupy newly emerging habitats. As such, our results serve as a baseline for the assessment of the future evolution of coral habitats, but the consideration of important biological and ecological factors and feedbacks will be required to make more accurate projections.

SOURCE: Biogeosciences

PDF URL: https://bg.copernicus.org/articles/9/4955/2012/bg-9-4955-2012.pdf

CITED BY COUNT: 52

PUBLICATION YEAR: 2012

TYPE: article

CONCEPTS: ['Coral', 'Temperate climate', 'Habitat', 'Ocean acidification', 'Resilience of coral reefs', 'Coral reef', 'Subtropics', 'Reef', 'Oceanography', 'Climate change', 'Ecology', 'Environmental issues with coral reefs', 'Effects of global warming on oceans', 'Environmental science', 'Global warming', 'Geography', 'Geology', 'Biology']