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Forecasting models to quantify three anthropogenic stresses on coral reefs from marine recreation: Anchor damage, diver contact and copper emission from antifouling paint

Adam D. Saphier^a ... Tegan C. Hoffmann^b

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Abstract

This research focuses on damage to coral reefs from three anthropogenic stresses: the dropping of anchors and their chains, human contact, and emission of copper from antifouling paints. Forecasting models are described that quantify degradation in terms of percentage of coral cover damaged/year or increasing levels of water toxicity/year. The models utilize a Monte Carlo simulation that applies a range of values or a probability distribution to each of the numerous uncertain variables. This model has the flexibility to adapt, and become more accurate, when users input assumptions specific to their diving sites. Given our specific assumptions for a frequently visited site, anchors and

their chains forecast a distribution of coral reef cover damage with a mean of 7.11% $\hat{\pm}$ 4.77%, diver contact forecast a distribution of coral reef cover damage with a mean of 0.67% $\hat{\pm}$ 0.38%, and antifouling paint forecast a distribution of copper level increase in the water with a mean of 0.037 $\hat{\pm}$ 0.014 ppb. The results support recommendations for the implementation and sustained use of several specific marine recreation practices.



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Keywords

Coral reefs; Marine recreation; Tourism; Diver damage; Anchors; Antifouling paint

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