Evidence that wastewater degrades coral reefs at multiple levels of ecological organization in the eastern Andaman Sea

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Runoff and sewage discharge from land developments can cause significant changes in water quality of coastal waters, resulting in coral degradation. Coastal waters of Thailand are influenced by numerous sewage outfalls associated with rapid tourism development. Water quality and biological assessment around the Phuket region was undertaken to quantify water quality and biotic characteristics at various distances from sewage outfalls. Strong gradients in water quality and biotic characteristics were identified as being associated with tourism concentration levels and seasonal variability. Water and reef quality tended to decrease with increasing tourist intensity, but improved with increasing distance from sewage discharge within each of the three study locations. However, the effect of wastewater discharge was not localized around the source of pollution, but appeared to be transported to non-developed sites by currents, and exacerbated by increased turbidity in the wet season. Degradation in water quality resulted in substantial ecological shifts in the form of (1) increased macroalgal density and species richness, (2) lower cover of hard corals, and (3) significant declines in fish abundance. Thus, the effects of nutrient pollution and turbidity can cascade across several levels of ecological organization to change key properties of the benthos and fish on coral reefs. Maintenance or restoration of ecological reef health requires improved wastewater management and run-off control for reefs to deliver their valuable ecosystems services.

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