Use Of An Eco-Epidemiology Approach To Assess Potential Risks Of Natural And Anthropogenic Factors, Including UV Filters, To Coral Community Status In Hawaii

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Abstract:

In the past few years, questions have been raised regarding the environmental safety of some UV filters used in personal, skin care and beach products to corals. In some cases (e.g., Hawaii, Key West, Palau) regulatory actions have been precautionary, leading to bans. Unfortunately, no regulatory authority has explicitly attempted to quantify the impacts of UV filters on corals relative to other forms of pollution or environmental factors. Eco-epidemiology is a methodology that considers species and communities as affected by complex combinations of multiple physical, chemical, and environmental conditions over time. This study assembled a large set of natural and human influenced factors (including potential risks of UV filters) along with coral cover data for the Hawaiian Island of Oahu to assess the potential adverse effects of UV filters on corals within the context of other factors.

All data were spatially analyzed using a geographic information system. Principal component analyses were used to determine the relationships of coral ecological data to natural and anthropogenic factors. Results indicated that coral cover could be explained via species diversity and abundance. These aspects and all other factors were then correlated to each other to determine if some factors could act as proxies for each other (e.g., beach visitors as a proxy for UV filters) and if any factors appeared to be highly related to coral diversity and abundance. Wave power, sea surface temperatures and sedimentation were shown to be highly correlated to coral ecological status. Statistically significant regressions for coral diversity included temperature anomalies and wave power, both of which addressed the vast majority of the variance. UV filters did not significantly contribute to decreases in coral diversity. Regressions for coral abundance indicated that sewage effluent and sedimentation were more significant than UV filter hazards. Hence, it appears that UV filter hazards do not significantly address reduced coral diversity and abundance whereas wave power, temperature and sedimentation appear as the dominant factors affecting coral ecological status.