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Using satellite imagery and low-cost, towed underwater video for coral reef mapping and monitoring in Sri Lanka

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Abstract

Coral reefs are being degraded at unprecedented rates due to direct anthropogenic impacts and climate change. Understanding coral reef distribution, condition and community composition is vital to developing better management. We attempted to map reefs within Kayankerni Marine Sanctuary, in eastern Sri Lanka using a simple towed video system for ground truthing coral assemblages and reef structure. Ground truthing was done using a Deep Blue Pro underwater drop camera towed from a boat and recording video of the substrate with latitude, longitude and time. Depth was recorded using a boat mounted Ray-marine Dragonfly echo sounder with video relay capability, and depth readings were corrected to account for tidal variation. Substrate and depth videos were synched, and still images were taken at specified intervals. Images were analyzed by substrate type based on dominant coral genera and growth forms. Substrate data was integrated into World View 3 satellite imagery corrected for atmospheric and water column scattering. Ground truthed sample points were taken as training samples for the Maximum Likelihood Supervised Classification (MLSC) for habitat classification. Analysis of video data and MLSC indicated a high level of accuracy ranging from 83% to 94% across the reef system. The Cohens Kappa statistic measures for interrater reliability was used to assess data accuracy and provided a high accuracy coefficient value of 0.81-0.93 across different sections of the reef system. Substrate cover across the mapped area was primarily sand (34.3%) interspersed with old coral rock and live coral. Most live coral areas (23.1%) had a mixed coral assemblage with some monospecific or single species dominated stands of branching *Acropora* (2.7%) and foliose *Montipora* (1.7). Habitat maps developed using remote sensing can be used for developing spatial plans, monitoring long term changes and documenting events such as mass coral bleaching. Using simple, low cost methods provide an ability to map large reef areas at relatively low costs, which is especially important in developing countries with limited resources for more advanced reef mapping.