

## What's a picture really worth? On the use of drone aerial imagery to monitor intertidal rocky shores

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Describing the distribution and abundance of organisms on the rocky intertidal zone is crucial to generate ecological models of broad scope and validity. Our aim was to combine aerial images with ground-based quadrat sampling to quantify mussel (*Mytilus galloprovincialis*) bed coverage and adult biomass for later use in biophysical models. A remotely piloted aircraft (V-form octocopter-drone) was used to conduct intertidal surveys, during low tides (<0.4m) over 9 study sites along the Portuguese central west coast. At each site, we collected low altitude (30m) high resolution aerial photographs (130 to 200 airborne photographs, 80% overlap, error estimates <1 pixel), encompassing an average intertidal area of 20000m<sup>2</sup>. Images were mosaicked, georeferenced and a 3D photogrammetric model was reconstructed with a ground resolution of 1cm/pixel. We conducted an analysis of the spectral signature of mussels' coverage and used it to perform a maximum likelihood supervised classification, with overall high classification accuracy (80-97%). Finally, adult mussel biomass parameters were used in a biophysical model of larval dispersal to improve the fine-scale variability of mussel larval supply in the area. Our results support several emerging studies which combine low altitude multispectral imagery with high resolution surface models and ground based observations as a viable and powerful tool for surveying intertidal ecosystems. Potential cost-competitive applications in marine resource mapping, monitoring and conservation are discussed.

**Keywords:** aerial imagery, rocky intertidal, spatial scale, Mussel bed