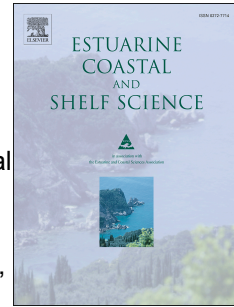


# Accepted Manuscript

What's a picture really worth? On the use of drone aerial imagery to estimate intertidal rocky shore mussel demographic parameters

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PII: S0272-7714(18)30321-4

DOI: [10.1016/j.ecss.2018.08.020](https://doi.org/10.1016/j.ecss.2018.08.020)

Reference: YECSS 5948

To appear in: *Estuarine, Coastal and Shelf Science*

Received Date: 16 April 2018

Revised Date: 2 August 2018

Accepted Date: 17 August 2018

Please cite this article as: Gomes, Inês, Peteiro, L., Bueno-Pardo, J., Albuquerque, R., Pérez-Jorge, S., Oliveira, E.R., Alves, Fátima L., Queiroga, H., What's a picture really worth? On the use of drone aerial imagery to estimate intertidal rocky shore mussel demographic parameters, *Estuarine, Coastal and Shelf Science* (2018), doi: [10.1016/j.ecss.2018.08.020](https://doi.org/10.1016/j.ecss.2018.08.020).

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## 19 20 **Abstract**

21 Describing distribution patterns of organisms on the rocky intertidal zone is crucial to generate  
22 ecological models of broad scope and validity. Our aim was to combine 3D photogrammetric  
23 models and spectral analysis derived from aerial images, with ground-based quadrat sampling  
24 to provide realistic measurements of mussel (*Mytilus galloprovincialis*) density, size and  
25 reproductive output. A remotely piloted aircraft (drone) was used to conduct intertidal  
26 photographic surveys during low tides (<0.4 m) over 8 study sites along the Portuguese central  
27 west coast. At each site, high pixel resolution photographs were collected at 30 m altitude (82  
28 to 247 photographs, 80% overlap, with a ground spatial resolution of approximately 0.8  
29 cm/pixel), encompassing an average intertidal area of 15200 m<sup>2</sup> per survey location. A mosaic  
30 was created from the images and these were georeferenced and a 3D photogrammetric model  
31 was constructed for each location. An analysis of the spectral signature for the different  
32 ground cover types was used to perform a maximum likelihood supervised classification with  
33 overall high classification accuracy (86.5% ± 4.3%, mean±SD). Additionally, we analysed the  
34 effect of environmental variables (substrate complexity and wave exposure) on mussel density  
35 on rocky substrate and size. Maximum mussel density occurred at intermediate values of wave

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