# ABSTRACT

*Ecklonia radiata* is the dominant macroalgae, the defining feature of the Great Southern Reef (GSR) and the only laminarian kelp in most of its distribution. Hence its services are environmentally, ecologically and socioeconomically important. Despite *E. radiata's* resilience to some temperature increase, it is reported that climate change related shifts can affect the early development of the species and had led to its loss. Therefore, there is a need to explore easy-to-use and rapid methods to monitor *E. radiata*. This research explores the use of Unmanned Aerial Vehicle (UAV) images to estimate the percentage of *E. radiata* in Aldinga Reef, South Australia, using a simple empirical classification model and explores optimal observational conditions to detect *E. radiata* from UAV images. The optimum observational conditions were explored by flying UAV at varying conditions. Images were captured over shallow intertidal (Zone I) and deeper subtidal (Zone S) environments at a UAV flying altitude of 20 m. Supervised Support Vector Machine (SVM) was used in ArcGIS Pro to classify them. SVM classification results were compared with *in-situ* validation and an accuracy assessment was carried out. The results show that it is recommended to collect UAV images at low tide and bright sunlight without cloud cover. This is because water attenuation with depth (i.e high tide) and lower light intensity (cloud cover) reduces the red spectral reflectance of *E. radiata* making it spectrally similar to other aquatic vegetation. UAV oblique images can capture *E. radiata* when UAV heading is aligned to sun azimuth with the sensor facing away from the sun and when UAV tilt is aligned to sun elevation above horizon angles. In intertidal zones, UAV nadir and oblique images can capture *E. radiata* at higher sun altitude angles (41◦) and with higher windspeeds (30km/hr) than recommended. In subtidal zones, images can be captured with higher sun altitudes and windspeeds than recommended to a certain degree of success, when overlapping UAV images are captured. The SVM classification model proposed can be used to classify and estimate *E. radiata* cover accurately in intertidal and shallow subtidal areas. However, in deeper subtidal zones the accuracy of this method was low. This method can be improved with the use of high spatial resolution bathymetry data to carry out water column correction. The use of sensors with higher radiometric resolution and exposure control can help better correct for illumination change in oblique images.