Spatial and temporal variation in spectral reflectance: Are seagrass species spectrally distinct?

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ABSTRACT: The spectral signatures of the seagrasses Zostera capricorni, Posidonia australis, and Halophila ovalis were investigated to determine whether species could be discriminated by remote sensing. The spectral reflectance of fouled and unfouled leaf samples collected from marine and brackish habitats at three estuaries in southeastern Australia were measured in the field with a spectroradiometer during each season in 1999 and 2000. Seagrass species were spectrally distinct regardless of whether the leaves were fouled by epibionts and despite spatial and temporal variability in the reflectance of each species. The visible wavelengths that penetrate water coincide with the regions of maximum absorption and characteristic reflectance by plant photosynthetic and accessory pigments. Strong and consistent differences in reflectance between species were recorded in the green wavelengths at 530-580 nm with additional discrimination in the regions 520-530 nm and 580-600 nm and at the red chlorophyll absorption trough at 686-700 nm. Species discrimination should be possible in the remote sensing of benthic aquatic vegetation using a hyperspectral sensor that has narrow bands centered on pigment-related spectral features in the visible wavelengths. The detection of statistically significant differences in intraspecific reflectance associated with the year, season, estuary, and habitat of sample collection suggests a potential for monitoring seagrass health and estuarine water quality. This study has produced the first spectral library of aquatic plant species to take into account the range of spectral variability expected for the species under natural conditions. The results provide a sound basis for future mapping of seagrass species in Australia.

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