Effects of epiphyte load on optical properties and photosynthetic potential of the seagrasses Thalassia testudinum Banks ex König and Zostera marina L.

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ABSTRACT: The biomass and optical properties of seagrass leaf epiphytes were measured to evaluate their potential impact on the photosynthetic performance of the seagrasses *Thalassia testudinum* Banks ex König (turtlegrass) and *Zostera marina* L. (eelgrass). Turtlegrass was obtained from oligotrophic waters near Lee Stocking Island, Bahamas; eelgrass was collected from a eutrophic environment in Monterey Bay, California. Leaf-epiphyte loads were characterized visually and quantified using measurements of their phospholipid biomass. Light absorption and reflectance of the intact epiphyte layer were determined spectrophotometrically. Turtlegrass epiphytes from the oligotrophic site absorbed a maximum of 36% of incident light in peak chlorophyll absorption bands, whereas higher epiphyte loads on eelgrass from the more eutrophic Monterey Bay absorbed 60% of incident light in peak chlorophyll absorption bands. The combination of intact epiphyte-leaf complexes and spectral measurements enabled us to construct a quantitative relationship between epiphyte biomass and light attenuation, and, by extension, between epiphyte biomass and seagrass photosynthesis. The model yielded a robust, positive relationship between epiphyte biomass and the absorption of photons in photosynthetically important wavelengths, and it generated a strong negative relationship between epiphyte biomass and spectral photosynthesis of their seagrass hosts. Furthermore, the calculations of photosynthesis highlighted the significant differences between PAR and spectral models of photosynthesis, illustrating that the spectral quality of the incident flux must be considered when evaluating the effects of epiphyte load on seagrass leaf photosynthesis. Verification of the model using direct measurements of photosynthesis and a variety of epiphyte and macrophyte combinations from different locations is warranted.