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## Cell-specific activity, photosynthesis and exopolymer dynamics in transient marine diatom biofilms.

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Microalgal biofilms, dominated by benthic, pennate diatoms, play an important role in the ecology, biogeochemistry and sediment dynamics of many shallow water marine ecosystems. This paper will describe some of the latest data on the coupling between algal species composition, migratory patterns, photosynthesis and extracellular polymeric substances (EPS) production, composition and loss in natural biofilms. Complex species-specific rhythms of vertical migration within the top few millimetres of sediment, coupled with differences in photophysiology between different algal species mediate the daily rate of photosynthesis of these biofilms. Associated with motility and photosynthesis is the production of carbon-rich exopolymers, which contribute to the mucilage providing structural integrity to the biofilm. Pennate diatoms produce a number of EPS types which differ in chemical composition, production patterns and abundance on mudflats. This EPS is an important source of carbon to heterotrophic organisms within the mudflat system. Production and loss measures indicate a high potential internal sink within biofilms for some of these carbon-rich EPS materials over diel time scales, suggesting close algal-bacterial coupling.