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Editorial

Organic Matter and Nutrient Cycling in Coastal Wetlands and Submerged Aquatic Ecosystems in an Age of Rapid Environmental Change—The Anthropocene

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Coastal ecosystems, such as marshes, mangroves, seagrasses and estuaries, are biogeochemical hotspots, receiving and transforming organic matter and nutrients from terrestrial watersheds and the coastal ocean. A large portion of the nutrients and organic material generally remains and cycles within the system, supporting high productivity and further cycling of elements [1,2]. Dynamic aerobic and anaerobic sediments foster important microbial transformations and chemical interactions that affect the availability of nutrients for productivity and, ultimately, affect water quality. Organic material generated by vegetation, algae, and organisms can be mineralized into inorganic forms available for plant and algal uptake or can accumulate in the soil matrix as sequestered organic carbon and nutrients. This organic material is a primary contributor to soil building or accretion that allows these systems to adjust to sea-level rise. What is not cycled or retained within the system is exported either through microbially mediated sediment–atmospheric fluxes such as denitrification, or through trophic transfer or erosion.

From an ecosystem services perspective, the biogeochemistry of coastal ecosystems is valued for improving or maintaining water quality, sequestering carbon dioxide from the atmosphere, and adjusting to sea-level rise through accretion, which protects communities and infrastructure along the coast [3]. However, over the last century, coastal wetland ecosystems have declined in extent by nearly 50% [4]. Meanwhile, nutrient and pollutant inputs have increased such that approximately 80% of freshwater and coastal ecosystems are eutrophic from anthropogenic inputs of nitrogen and phosphorus [5,6]. The management and mitigation of these impacts depend on our understanding of both baseline conditions and how these changes affect the system.

This Special Issue includes studies that focus on understudied areas of research in the biogeochemistry of coastal ecosystems such as the role of micronutrients and soil geochemical processes in mangrove ecological energetics [7] and the variability of nitrogen fixation in seagrass meadows [8]. The importance of organic matter to accretion was illustrated across a salinity gradient in a Chesapeake Bay sub-estuary [9]. The impact of human activities on nutrient cycling is the focus of research on nitrogen retention and fluxes in an nitrogen-rich created marsh in Chesapeake Bay [10] and a study on how changes in hydrology and submerged aquatic vegetation in Florida Everglades lakes affect nitrogen and phosphorus exchange across the sediment–water interface [11]. Finally, a novel approach to infer spatially integrated biogeochemical function of a coastal lagoon was illustrated using stable isotopes of carbon, nitrogen, and sulfur in surficial sediments in a heterotrophic seagrass-dominated lagoon on the Pacific coast of Baja California, México [12]. As a whole, these studies further our knowledge of organic matter and nutrient processing in coastal ecosystems and provide a foundation upon which to make important management decisions.

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