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Editorial: Metal contamination, bioaccumulation, and toxicity in coastal environments under increasing anthropogenic impacts

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Editorial on the Research Topic

[Metal contamination, bioaccumulation, and toxicity in coastal environments under increasing anthropogenic impacts](#)

Motivation

The coastal zone is the interface between land and sea. It provides important habitats not only for humans but also for wildlife in this ecoregion, including many endangered species. However, in recent decades, the coast has been subjected to increasing anthropogenic disturbances. Rapid industrial development and coastal urbanization have dramatically altered the morphodynamics and hydrodynamics of the coast, and have also led to an upsurge in the discharge of metal pollutants into the coastal environment. This puts enormous pressure on receiving ecosystems and indirectly affects social and economic activities. Unlike organic pollutants, metals are non-degradable pollutants that persist in the environment once discharged. Coastal effluents have a large dilution capacity compared to inland waters, so metal pollution is rarely considered a major problem. However, decades of metal accumulation in coastal sediments and continued metal inputs are beginning to have new impacts on coastal ecosystems. The cycling of metals in coastal waters is likely to be very different from the past, as it is intertwined with climate change, ocean acidification, sea-level rise, storm surges, eutrophication, hypoxia and overfishing. In addition, coastal and estuarine environments are increasingly receiving large amounts of plastic waste, which may become a new source of metals in these regions, as plastic materials often contain metals as additives and catalysts in the manufacturing process.

A Research Topic titled “*Metal Contamination, Bioaccumulation, and Toxicity in Coastal Environments under Increasing Anthropogenic Impacts*” was therefore developed for Frontiers in Marine Science. This Research Topic comprises six papers that cover a broad range of related topics, including the negative effects of metals, metal nanoparticles, and other anthropogenic influences on marine organisms.

Metal effects in coastal waters: when old problems meet new environmental issues

Metals in the marine environment can come from both natural and anthropogenic sources. Humans have significantly increased the input of metals into the environment and metal pollution has become a major environmental problem in coastal waters. Sources of metal pollution include mining, agricultural fertilizers, industrial and municipal wastes. Upon entering seawater, metals complex with inorganic and organic ligands in seawater and exist in different forms, of which the free ionic form is considered to be the most toxic to marine organisms. The study of bioaccumulation and toxicity of metals is essential to understand the threat of metals to marine ecosystems and the hazards of metals to humans.

The distribution and fate of metals in the marine environment and the bioaccumulation and toxicity of metals in marine organisms have been intensively studied over the past decades. Anthropogenic changes in seawater chemistry such as nutrient stoichiometry are recognized to influence the effects of metals in the marine environment. However, new questions remain to be answered. Coastal ecosystems are facing new problems such as climate change and plastic pollution. It is still poorly understood how increasing temperature, ocean acidification and sea level rise will combine to affect the bioaccumulation and trophic transfer of metals in marine organisms. Increased temperature, decreased pH, and habitat loss in could change the metal fate and effect in coastal ecosystems. In particular, how climate change affects the production of methylmercury (MeHg), a toxic form of mercury, is an interesting but still largely unexplored topic. In addition, given the large amount of plastic waste being discharged into coastal waters, it is urgent to understand the impact of these metal-containing plastics on seawater quality and marine life. Exploring these questions should advance our understanding of metal effects on coastal ecosystems in the context of increasing human disturbance.

Contribution and perspectives

In this Research Topic, we introduce the Research Topic “*Metal Contamination, Bioaccumulation, and Toxicity in Coastal Environments under Increasing Anthropogenic Impacts*”. The toxic

effects of metal or metal nanoparticles on marine organisms such as phytoplankton, bivalves, and sea turtles are demonstrated in the accepted papers. These studies can generate some implications of metal effects in coastal waters suffering from increasing anthropogenic disturbances.

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Conflict of interest

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