Alkalinity in Tidal Tributaries of the Chesapeake Bay

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Despite the important role of alkalinity in estuarine carbon cycling, the seasonal and decadal variability of alkalinity, particularly within multiple tidal tributaries of the same estuary, is poorly understood. Here we analyse more than 26,000 alkalinity measurements, mostly from the 1980s and 1990s, in the major tidal tributaries of the Chesapeake Bay, a large, coastal-plain estuary of eastern North America. The long-term means of alkalinity in tidal-fresh waters vary by a factor of 6 among seven tidal tributaries, reflecting the alkalinity of non-tidal rivers draining to these tidal tributaries. At 25 stations, mostly in the Potomac River Estuary, we find significant long-term increasing trends that exceed the trends in the non-tidal rivers upstream of those stations. Box model calculations in the Potomac River Estuary indicate that the main cause of the estuarine trends is a declining alkalinity sink. The magnitude of this sink is consistent with a simple model of calcification by the invasive bivalve *Corbicula fluminea*. More generally, in tidal tributaries fed by high-alkalinity non-tidal rivers, alkalinity is consumed, with sinks ranging from 8 to 27% of the upstream input. In contrast, tidal tributaries that are fed by low-alkalinity non-tidal rivers have sources of alkalinity amounting to 34 to 171% of the upstream input.