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Variable hydrology and salinity of salt ponds in the British Virgin Islands

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Abstract

Caribbean salt ponds are unique wetlands that have received little scientific attention. They are common features of dry Caribbean coastlines, but they are threatened by rapid coastal development. We compared hydrology and salinity of 17 salt ponds in the British Virgin Islands. Ponds were mostly hypersaline (>50 ppt), and they exhibited dramatic salinity fluctuations in response to rainfall and evaporation. Individual ponds varied in their mean salinities and thus experienced different ranges of salinity. Differences in mean salinity appeared to be linked with hydrological characteristics. Hydrological variation ranged from permanently inundated ponds with direct sea connection to those fully isolated from the sea and retaining water only after rainfall. We characterized groups of ponds by their major hydrological characteristics, particularly their period of inundation and their degree of connection with the sea. The resulting classification appeared to reflect a continuum of increasing isolation from the sea, concurring with published geological records from salt pond sediments elsewhere. The patterns of variability and succession described here are applicable to salt pond management interests throughout the Caribbean.

Background

Salt ponds are enclosed or mostly enclosed water bodies that occur within coastal mangrove wetlands. They are typically hypersaline, as defined by Hammer, 1986 [1], with water salinities typically in excess of 50 parts per thousand (ppt) [2]. Salt ponds and their surrounding mangrove forests, together known as "basin mangrove forests" [3], are the predominant type of coastal wetland in the Caribbean [4]. These wetlands provide important ecological services, including storm protection and flood mitigation, shoreline stabilization, erosion control, and retention of nutrients and sediments [5-7]. They also provide critical habitat and food resources for resident and migratory birds in the Caribbean [8].

Mangrove wetlands throughout the Caribbean are being replaced by coastal developments, and they are now considered to be one of the most threatened habitats on Earth [9]. Despite their ecological importance, salt ponds have received little scientific attention and remain poorly understood [10,11]. A thorough description of salt ponds is urgently needed to provide baseline information for wetland conservation efforts in the Caribbean and to establish frameworks for conservation and management protocols.

This study describes the physical characteristics of salt ponds in the British Virgin Islands (BVI), a small archipelago at the eastern end of the Greater Antillean island chain in the Caribbean (Figure 1). Nearly sixty salt ponds occur