Remarkably coherent population structure for a dominant Antarctic *Chlorobium* species

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Abstract

In Antarctica, certain photosynthetic microorganisms produce enough food in the summer to sustain aquatic ecosystems through the long, dark winters. One species of photosynthetic *Chlorobium* bacteria dominates Ace Lake in East Antarctica, and its abundance changes drastically with the seasons. However, the importance and abundance fluctuations of this species in other Antarctic water bodies are unclear. To learn more, a recent metagenomics study examined *Chlorobium* sequences from Ace Lake that spanned seven years, plus sequences from two nearby marine basins. The species *Candidatus* (Ca.) *Chlorobium antarcticum* dominated all three aquatic systems, and its genome varied little. However, there was seasonal genomic variation in the ability to synthesize cobalamin, which is required for photosynthetic growth. Since most bacteria can't synthesize their own cobalamin, Ca. *Chlorobium antarcticum* is likely a major source of cobalamin in these three ecosystems. In addition, a comparison with other bacterial genomes revealed that the species is unique to Antarctica. Ca. *Chlorobium antarcticum* tended to harbor generalist viruses rather than specialist viruses, suggesting that the seasonality of the species helps prevent specialist viruses from thriving. Although additional studies on more locations are needed, the results highlight the uniqueness of Antarctic organisms and the critical roles that individual species can play in their ecosystems.