**Identification, association and coevolutionary patterns of the photobionts associated with *Protoparmelia* s.str.**

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Species diversity and association patterns of symbiotic systems are a result of the interplay between evolutionary and environmental forces. Here we studied how macroclimate and evolution may shape the symbiont diversity and association patterns in *Protoparmelia* s.str., a small cosmopolitan genus of about 30 species occupying different macroclimates. We generated the multi-locus phylogenies followed by coalescent-based species delimitation of *Protoparmelia* s.str. and their green algal symbionts *Trebouxia*. Species delimitation approaches indicated that 23 *Protoparmelia* species associate with 20 *Trebouxia* species. We found that one-to-one fungal-algal relationships are more common in warmer climates, whereas one-to-many relationships are more common in cooler climates. Coevolutionary analyses suggest congruent fungal-algal phylogenies. We did not find any evidence for cospeciation even in highly selective associations. Instead host switch is a common evolutionary event in warm climates, whereas failure of the photobiont to diverge with its fungal host is a frequent event in cooler climates. We conclude that both fungus and alga displayed higher selectivity in the warmer regions as compared to the cooler regions and that different coevolutionary forces drive fungal-algal associations in different macrohabitats.