Abundance, composition and succession of sessile subtidal assemblages in high wave-energy environments of Central Chile temporal and depth variation

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Abstract

Limited knowledge exists about the sessile species found in wave exposed subtidal environments of southeastern Pacific shores, including the temporal patterns of colonization, growth, succession, and the potential problems they pose to human industries, including oceanic aquaculture and renewable wave energy. Filling this information gap is urgent considering the increased interest to exploit these environments. We conducted a 23mo long experimental study on the coast of central Chile to characterize biofouling colonization, rates of accumulation and succession patterns at two different depths and different substrates. Throughout the study, we recorded 62 species, 36 of which were sessile. Biomass accumulation rates were among the highest recorded, with significantly higher and more seasonal rates above than below the thermocline. Slightly but significantly higher biomass was observed in ceramic tiles than acrylic or safety-walk surfaces, but such differences varied with depth and month of the year. In all materials, surface cover reached nearly 100% within about a month of exposure at 5 m deep in spring and summer months, and over 70% at 15 m deep, with lower cover in winter months. The patterns of total biofouling biomass measured in air (weight) were quite different to those measured submerged in seawater, highlighting the importance of species attributes (body density) when assessing risks of biofouling for different human-made structures. The hydrozoan Obelia geniculata was by far the fastest colonizing macro-invertebrate species throughout the year and both depths, covering the entire plate surface in spring-summer months. Community composition shifted in favor of large-bodied, heavier species when surfaces were exposed for more than 6mo. Succession in shallow waters followed a deterministic path from hydrozoans, to the large-bodied barnacle Austromegabalnus psittacus to dominance by the tunicate Pyura chilensis. Final successional stages appear to be the same in deeper waters, but dominance was not achieved before the end of the experiment. Ecological perspectives and simple recommendations to developers and the productive sector are discussed.