

Miocene barnacle facies: a review with examples from the Old World (Italy and France) and the New World (Peru)

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Acorn barnacles (sessile cirripedes) are a common group of carbonate producers in modern and fossil shallow-water shelf environments. These suspension-feeding crustaceans occur on any available surface in shallow seas, including “mobile surfaces” like turtles and whales. They are common at middle and high latitudes, but they can also thrive at low latitudes, especially in nutrient-rich environments. The fossil record of sessile cirripedes dates back to the Cretaceous, but it is only during the Neogene that barnacles became really common in sedimentary sequences. Based on the ecology of modern taxa, these facies are generally interpreted as shallow-water, high-energy deposits. Although this interpretation is usually reasonable, barnacle facies clearly display a variability that reflects significant environmental differences. The aim of this work has been to investigate the environmental factors that govern the development of barnacle facies, which might prove useful for palaeoenvironmental reconstructions. In doing so, we investigated this type of facies by analysing, from palaeontological, sedimentological and perspectives, four early Miocene examples from Northern Italy, Southern France and Southwestern Peru, and compared our results with existing information on both modern and fossil barnacle-rich deposits. The studied facies can be divided into two groups. The first one consists of very shallow, nearshore assemblages where barnacles are associated with an abundant, mollusc-rich, hard-substrate biota (e.g., barnamols). The second one includes a barnacle-coralline algae association, here named “barnalgal” (= dominated by barnacle and red algae), related to a deeper setting. The same pattern occurs in the distribution of both fossil and recent barnacle facies. The majority of these are related to very shallow, high-energy, hard-substrate settings, an environmental scenario that represents the optimum for the development of a barnacle facies, but exceptions do occur. Atypical facies can be identified through a complete analysis of both the skeletal assemblage and the barnacle association, showing that barnacle palaeontology has significant utility in palaeoenvironmental reconstruction.