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Sound travels effectively through water and is used by numerous marine organisms for navigation, habitat selection, and predator avoidance. The marine soundscape is composed of a multitude of abiotic and biotic sounds which may originate from wave action or crepuscular fish vocalizations. Different marine habitats may be characterized by their own unique acoustical features, with different sound-producing organisms present in some but not others. Furthermore, the physical characteristics of the habitat may affect the soundscape as well. Soft-bottomed substrates may absorb sound more effectively, contrasting hard-bottomed substrates. However, despite the significance of sound to the function of many marine organisms, the marine soundscape remains poorly understood and documented. In many estuarine environments, the distinct, high-frequency snaps of *Synalpheus* spp., or the snapping shrimp, dominate the marine soundscape. Snapping shrimp produce their signature snaps when they rapidly close their claws, forming a cavitation bubble which quickly pops. The goal of this study was to explore the quantification of snapping shrimp sounds as a potential metric for studying acoustic variability between different benthic environments. 30-second-long acoustic recordings were made at four sites within Kaneohe Bay, Oahu, Hawai’i with each site defined by its substrate composition: Mud, Sand, Pavement, or Coral Reef. Sites were chosen based on a previous benthic substrate assessment and preliminary observations. Depth was considered a potential factor and accounted for. In addition to snaps, other acoustic metrics such as mean SPL (sound pressure level), median SPL, mode SPL, and SEL (sound exposure level), were considered predictors of substrate composition. The use of PAMGuide allowed for the quantification of all acoustic metrics besides snapping shrimp snaps, which were identified individually within each sample. The capacity of snapping shrimp snaps in distinguishing different benthic habitats was supported by a principal component analysis and a multi-response permutation procedure. All acoustic metrics were significantly negatively correlated with axis 1. There were more recorded snaps at the coral reef study site when compared to all other study sites. These findings illustrate the variability of snaps between benthic environments, highlighting a crucial source of information utilized by many marine organisms.

Key words: passive acoustic monitoring, acoustic variability, snapping shrimp, marine soundscape, acoustic ecology, coral reef noise

Figure 1. One-dimensional graph displaying significant PCA results. Due to the other axes lacking significance (p >0.05), they were not included in this figure. Most of the variability in axis 1 was determined by shrimp snaps. Sites towards the negative end of the axis featured more recorded snaps, while sites towards the positive end featured less recorded snaps. Both coral reef habitats feature a negative score, with the other benthic habitats feature positive scores.