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The sense of active touch in sea otters

Sea otters (*Enhydra lutris*) consume a variety of cryptic benthic invertebrates in conditions that are often turbid or poorly lit, and individuals tend to specialize on particular prey items even when other food types are available. Foraging theory predicts that, in food-limited environments, minute differences in search and handling time can drive such prey specialization. However, the proximate mechanisms (i.e., sensory and cognitive abilities) that enable sea otters to identify and select potential prey items are virtually unknown. While their underwater behavior has not been described, sea otters are assumed to rely on an enhanced sense of touch to forage in patches with complex topographic features. To explore this possibility, we used behavioral psychophysical methods to investigate sea otter tactile abilities in air and under water for both paws and whiskers. We used a two-alternative forced choice procedure to measure the ability of a trained sea otter to discriminate between pairs of stimuli that differed in texture using only her paws or only her whiskers. For each tactile structure in each medium, we measured the subject's discrimination threshold, as well as corresponding latency (i.e., decision time) and behavioral strategy. Our subject maintained equal sensitivity in air and underwater, and the sensitivities of both tactile structures were comparable to those of other marine and tactile specialists. However, the subject's paw discrimination threshold was lower than her whisker discrimination threshold, indicating that paws may be the more sensitive tactile structure in sea otters. The results from these controlled experiments support that sea otters have sensitive and quick active touch with their paws and whiskers, which corresponds to our observations of their surface behavior. Our findings provide general insight into underwater foraging, and specifically, how sea otters may use active touch to detect, discriminate, and manipulate hard-shelled invertebrate prey.