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Aquatic foraging in shorebirds

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Shorebirds are organisms that show a high ecological plasticity, which allows them to cope with a changing environment and to exploit a wide range of prey in distinct habitats. Most foraging ecology studies on shorebirds have been carried out on intertidal mudflats, which can be classified as terrestrial media. Nevertheless, shorebirds are able to feed on prey suspended in the water column. Assuming that the feeding mechanisms of vertebrates are build upon the physical constrains impose by the medium, it is clear that the aquatic medium possesses a distinct set of features compared to the terrestrial medium, such as viscosity, drag forces or light refraction. However studies related to the effects that environmental features have on foraging mechanisms of shorebirds are scarce. We describe the capacity of Dunlins (*Calidris alpine;* n=20), Sanderlings (*C. alba;* n=51), Little Stint (*C. minuta;* n=27) and Curlew Sandpipers (*C. ferruginea;* n=34) to visually assess prey position and depth in the water column, adjusting to the constraint impose by the light refraction. We found that the depth at which the prey is situated has a significant effect on the strike mode (Dunlin: ANOVA, $F=6.83$, $df = 6$, $P=0.001$; Sanderling: ANOVA, $F=16.35$, $df=6$, $P=0.001$; Little Stint: ANOVA, $F=12.15$, $df=6$, $P=0.001$; Curlew Sandpiper: ANOVA, $F=10.22$, $df=6$, $P=0.001$). Modulation of the strike was produced depending on the prey depth in the water column: an open-billed attack was associated with the prey being in the surface layers of the water column, while a close-billed attack occurred with the prey in the lower layers of the water column. We hypothesize that this strike modulation is a strategy to minimize the effect of the bow wave and the drag forces characteristic of the aquatic medium.