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The use of distal rhynchokinesis by shorebirds in the aquatic medium

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Up to now, shorebirds' distal rhynchokinesis is the only type of kinesis to be related to a specific terrestrial (mud) feeding behavior - that being the probing technique. Distal rhynchokinesis is used to capture and handle prey efficiently in the substratum, since distal rhynchokinesis minimizes the displacement of substratum and minimizes the bending forces acting on the bill. In addition, for handling and extracting prey efficiently, sandpipers use the bill as forceps and grasp prey only with the bill tip. This produces a concentration of the grasping force where the jaws contact at the bill tip. We describe for the first time the use of distal rhynchokinesis by Dunlins (*Calidris alpine*), Sanderlings (*C. alba*) and Little Stints (*C. minuta*) to capture prey items from the water column. We hypothesize that the functional explanation of the aquatic use of the distal rhynchokinesis is similar to that given for the terrestrial medium. The aquatic use of the distal rhynchokinesis may be related to an attempted reduction of the effect of drag forces and bow wave produced by the approaching predator when the jaws are fully opened, this disturbing the water, in turn producing prey displacement. Distal rhynchokinesis may minimize the displacement of water. If the distal part of the upper jaw alone is elevated and the lower jaw is depressed, the volume of water displaced and disturbance is minimal. As in the case of the terrestrial medium, distal rhynchokinesis may assist in the handling and efficient extraction of prey from water.