

The effect of water surface tension on feather wettability in aquatic birds

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Abstract: Birds are dependent upon an insulating layer of air within the plumage for effective thermoregulation. The feathers of aquatic birds must therefore be highly water repellent to prevent the displacement of the air layer. This study investigated the effects of hydrostatic pressure, which is related to body mass and behaviour, and water surface tension on the wettability of adult contour feathers of lesser scaup, *Aythya affinis*, canvasbacks, *A. valisineria*, and Canada geese, *Branta canadensis minima*. Penetration pressure (P_p) of pure water (surface tension $72 \text{ mN} \cdot \text{m}^{-1}$) was 1690 ± 128 , 2199 ± 173 , and $2096 \pm 115 \text{ N} \cdot \text{m}^{-2}$ in lesser scaup, canvasbacks, and Canada geese, respectively. This was approximately three times the pressure actually exerted by the birds floating on water and approximately twice the maximum pressure exerted in partially submerged birds. P_p varied as a nonlinear function of water surface tension. It is concluded that these species of waterfowl will be instantly wetted if water surface tension is reduced to $<40 \text{ mN} \cdot \text{m}^{-1}$, and will be wetted during normal activities at surface tensions below $50 \text{ mN} \cdot \text{m}^{-1}$.