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Bristles reduce force required to fling wings apart in small insects. SHANNON JONES, YOUNG YUN, TYSON HEDRICK, BOYCE GRIFFITH, LAURA MILLER, University of North Carolina at Chapel Hill — The smallest flying insects commonly possess wings with long bristles. Little quantitative information is available on the morphology of these bristles, and the functional importance of these bristles remains a mystery. In this study, we used the immersed boundary method to determine via numerical simulation if bristled wings reduced the force required to fling the wings apart during "clap and fling". The challenge of studying the fluid dynamics of bristles was in resolving the fluid flow between the bristles. The effects of Reynolds number, angle of attack, bristle spacing, and wing-wing interactions were investigated. We found that a bristled wing experiences less force than a solid wing, however bristled wings may act more like solid wings at lower angles of attack than they do at higher angles of attack. In wing-wing interactions, bristled wings significantly decrease the drag required to fling two wings apart compared with solid wings, especially at lower Reynolds numbers. These results support the idea that bristles may offer an aerodynamic benefit during clap and fling by reducing the force required to fling the wings apart in tiny insects.

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