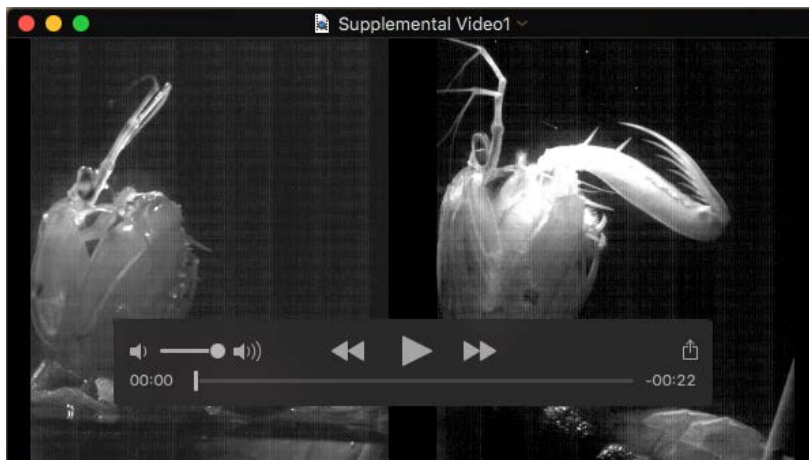


Figure S1. Morphometric analyses of *S. mantis* to assess carpus sliding during strike and raptorial appendage segments used to estimate mass. **A.** The change in angular rotation (red trace, smooth data with polynomial 10 function) of a slow air and a **B.** fast water strike vs. carpus sliding during a strike (black line). C_T is the time (in ms) from initiation of carpus movement away from merus (vertical dashed line) to the time propodus rotation is initiated (red vertical line). Value in lower right corner of A and B traces is peak angular velocity (deg/s) of strike. **C.** C_T times measured from strikes with peak velocities less than 8000 deg/s and greater than 15,000 deg/s. **D.** Photograph of *S. mantis* depicting digitization points for calculating angular rotation (white circles 1-4), carpus sliding (black squares C1-C2), and locations of measurements collected from raptorial appendage segments used to estimate mass. **E.** Relationship of dactyl length measurement to dactyl mass. **F.** Propodus width vs. mass. **G.** Metric value of merus width multiplied times saddle width vs. meral mass. Black circles, mass and morphometric data collected from 15 fresh raptorial appendages from 12 animals not used in air/water experiment; triangles, morphometric values of raptorial appendage segments from each individual evaluated in air/water strike experiment. Subscript numbers represent individual numbering reported in Fig 1B. Colors in B-D correspond to segment measurements in A: red, dactyl; yellow, propodus; blue, merus. ; paired T-test significant groups: **, p-value < .001.



Movie 1. *S. mantis* induced to strike in water and in air. Notice how the lack of stability in the merus-propodus joint in air

Table S1: Raptorial Limb Morphology and estimated masses in *Squilla mantis*

| Animal | Propodus | | | Dactyl | | |
|-------------|----------|-------------|-------------------|----------|-------------|-------------------|
| | Mass (g) | Length (mm) | Inertia (g.mm.mm) | Mass (g) | Length (mm) | Inertia (g.mm.mm) |
| 1 | 1.27 | 41.3 | 722 | 0.27 | 34 | 118 |
| 2 | 0.93 | 35.5 | 391 | 0.23 | 32.1 | 82 |
| 3 | 0.94 | 34.1 | 364 | 0.28 | 34.5 | 111 |
| 4 | 0.96 | 34.5 | 381 | 0.23 | 31.9 | 80 |
| 5 | 0.77 | 33.9 | 295 | 0.12 | 26.5 | 35 |
| 6 | 0.75 | 32.5 | 264 | 0.21 | 31.1 | 68 |
| 7 | 1.08 | 33.9 | 414 | 0.17 | 28.8 | 51 |
| Mean | 0.96 | 35.1 | 404 | 0.22 | 31.3 | 78 |
| S.D. | 0.18 | 2.9 | 150 | 0.06 | 2.8 | 30 |