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Meeting Abstract

9.1 Jan. 4 **Extreme forces and jaw size variation in trap-jaw ants** *SPAGNA, J.C.*; PATEK, S.N.; VAKIS, A.I.; SUAREZ, A.V.; University of Illinois, Urbana-Champaign; University of California, Berkeley; University of Illinois, Urbana-Champaign; University of Illinois, Urbana-Champaign* jspagna@uiuc.edu

The trap-jaw ant *Odontomachus bauri* (Formicidae: Ponerinae), produces the fastest self-propelled animal prey strikes known to science, averaging 38.4 m/s. The workers of this species use their mandibles for both trapping prey and propelling themselves into the air or away from danger. However, there is notable interspecific variation in workers' head, body, and mandible size and shape among the 64 species of this genus. Here we test the hypothesis that morphological variation across several *Odontomachus* species— *O. bauri, O. haematodus, O. erythrocephalus, O. clarus and O. brunneus*— is coupled with differences in jaw kinematics in terms of speed, acceleration, and force. We video recorded jaw-snaps of these species at 50,000-84,000 frames per second, and tracked the jaw movements to measure these parameters. Though speed might be thought to be a critical variable in such a high-speed system, differences in maximum tangential speed and maximum acceleration differed little between species (mean speed across all species = 38.9 m/s, S.D. 14.0 m/s, mean maximum acceleration $2*10^6$ m/s/s, S.D. $1*10^6$ m/s/s). However, given the nearly two-fold range of jaw mass and length between species (minimum 0.07 mg, 0.9 mm for *O. clarus*, maximum 0.17mg and 1.5 mm for *O. erythrocephalus*), with similar speeds and accelerations, the larger-jawed ants produce greater maximum jaw forces, ranging from 42 mN for *O. clarus* to 198mN for *O. erythrocephalus*. This increased force exceeds differences in body mass and predicts increases in jaw-performance during multiple behaviors, including escape jumps, prey-ejection, and predatory strikes in larger *Odontomachus* species.