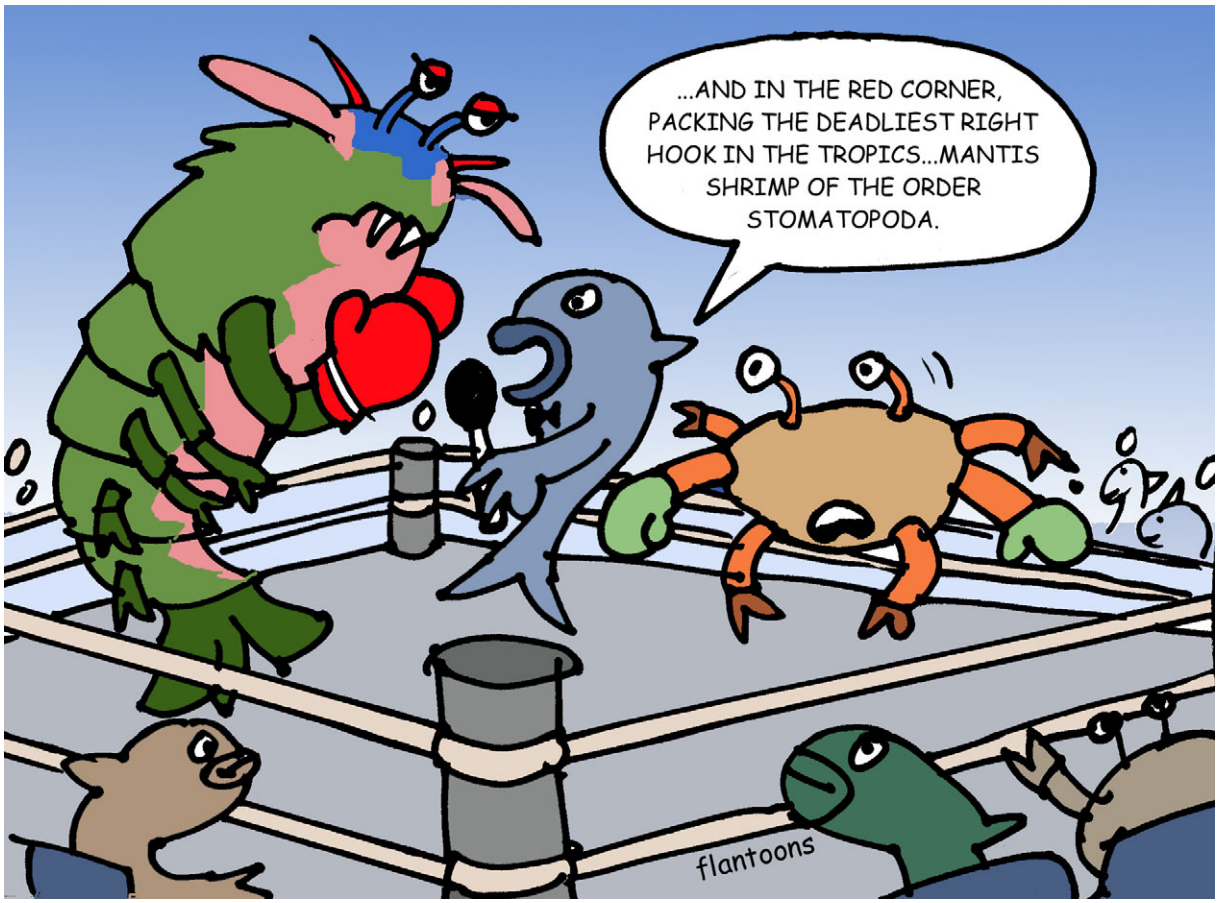
ELASTIC ENERGY POWERS MANTIS SHRIMP PUNCH



When a lurking mantis shrimp strikes, the victim rarely knows what hit it. Uncoiling its raptorial appendages in less than 2 ms, mantis shrimp dispatch their prey quickly. Sheila Patek, Travis Zack and Thomas Claverie explain that the shrimp's explosive strikes are powered by energy stored in spring structures in the shrimp's exoskeleton, 'but little is known about the dynamics and location of elastic energy storage structures in this system,' they explain. Curious to find out more about how the crustaceans strike, the team used computed tomography to get inside mantis shrimp's skeletons and measured the force required to compress raptorial appendage structures that could launch a lunge (p. 4002).

Calculating the energy stored in the merus region of the appendage, the team realised that it must be stored in highly mineralised internal bar structures in the limb. And when the team cut the bars, they found that it was impossible to store energy in the system: the bars are the elastic structures that store the shrimp's phenomenal power. The team also modelled energy storage in the bar structures, and realised that the structures were behaving just like conventional springs: they store energy provided by the extensor muscle as the muscle contracts, and release the energy explosively when the latches release.

'The spring acts as a power amplifier,' Patek explains, and she estimates that by storing energy in the compressed spring, the tiny 97 mg extensor muscle could amplify its power output more than 27 times.

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Zack, T. I., Claverie, T. and Patek, S. N. (2009). Elastic energy storage in the mantis shrimp's fast predatory strike. *J. Exp. Biol.* **212**, 4002-4009.

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