INSIDE JEB

Vortices give rusty crayfish a push

A rusty crayfish (*Faxonius rusticus*) tail flipping. Photo credit: Todd Currier.

Male crayfish are notoriously boastful, growing enormous claws – chelae – to impress the ladies. But they can also be the most colossal liars, telling fibs about their prowess with oversized chelae that can also hamper their manoeuvres. Knowing that some species trade off manoeuvrability for success in love, Jocelyn Hunyadi and Ethan Clotfelter, from Amherst College, USA, along with Todd Currier and other colleagues from the University of Massachusetts and the New Jersey Institute of Technology, USA, decided to investigate how the ungainly appendages affect the ability of rusty crayfish (*Faxonius rusticus*) to get about and whether males have compensated for the unwieldy appendages by building up other parts of their bodies.

Cooling 81 of the invasive crustaceans – males and females ranging from 8 to 30 g – to sedate them, Hunyadi measured their vital statistics (body length, chelae size and tail) before triggering the animals to beat a retreat with a flip of the tail to find out how fast they push off. Next, the team attached a force transducer to the crayfish's back to record the force exerted by their mighty tails before filming their departure in water laced with minute sparkling beads illuminated by a laser to visualise how the animals propel themselves through water.

Not surprisingly, the crayfish – both males and females – with the largest chelae took flight at the slowest speeds, but when the team checked the animals' physique to see whether the males had compensated for their oversized claws, they found they had not. The only feature that seemed to give the males an extra boost was the uropods, comprising the fan at the end of the crustacean's tail, which increased the force generated when the animals pushed off. And, when the team analysed the swirling patterns in the water as the crayfish launched forward, instead of a jet of water being squirted out from between the tail and abdomen during a tail flip, the scientists realised that the rusty crayfish were paddling with their hindlegs, directing water toward the tail as it curled inward and generating a propulsive spinning vortex at the tip that sent the crayfish forward when the vortex went spinning off.

Explaining that fish depend on vortices spinning from their fins for propulsion, the team says, 'To our knowledge, this is the first confirmation of vortex formation in a decapod crustacean'.

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