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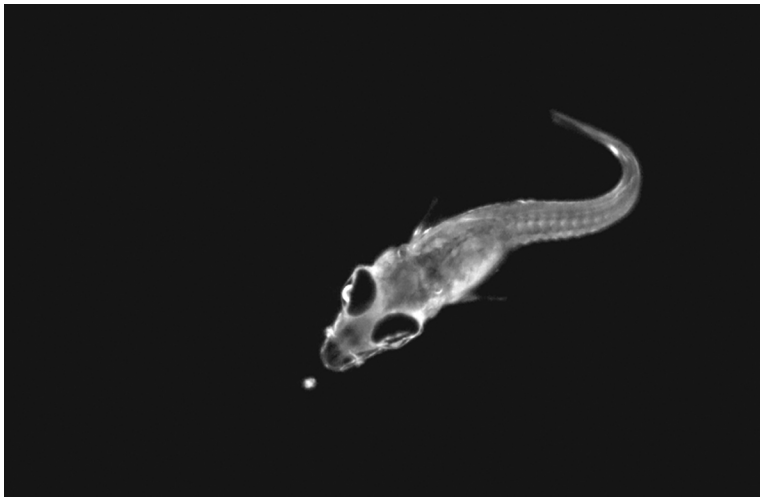
INSIDE JEB

Clownfish larvae J-curl to catch copepods



A newly hatched clownfish larva curled ready to strike at plankton. Photo credit: Eve Robinson.

When a predatory fish prepares to strike at an unsuspecting victim, it twists its body into a deadly S-shape, ready to straighten instantaneously as it lunges forward. But as any parent knows, it can take a while for youngsters to get to grips with feeding themselves, and fish larvae are no exception. Although some lack the speed and accuracy to intercept a moving target, opting for a more sedentary diet until their coordination improves, others manage to seize passing snacks successfully despite their diminutive size. Yet it was unclear whether these feisty larvae follow in their parents' S-shaped footsteps, or tread a different path to snap up their prey. Intrigued by the possibility that the larvae that target live dinners do something different from mum and dad, Lillian Tuttle, Eve Robinson, Mary Fashingbauer, Daniel Hartline and Petra Lenz from the Pacific Biosciences Research Center, Hawaii, USA, with Rudi Strickler from the University of Wisconsin-Milwaukee, USA, decided to catch clownfish (*Amphiprion ocellaris*) larvae in the act of pouncing on scrumptious plankton to find out how their attacks unfurl as they age.

After rearing minute freshly hatched clownfish newborns in the lab, Robinson offered the hungry larvae – ranging in age from 1–5, 6–9 to 11–14 days old – the chance to strike at nippy home-grown copepods while she and Strickler filmed the youngsters' high-speed lunges. 'It was challenging to film microscopic interactions between a freely swimming fish larva and a copepod while keeping both in focus', chuckles Robinson, adding that Strickler's camera system was perfectly designed to follow the larvae's strikes with high precision.

When Fashingbauer painstakingly digitised the larvae's postures as they curled their bodies in preparation for a strike, it was clear that instead of coiling into a curvy S, they twisted their rear ends into a general J-shape; the youngest (~5.5 mm long) larvae struck a question-mark-shaped pose, while the oldest pulled a looser hockey stick-shaped posture, bending their tails to one side before striking at a passing copepod. Analysing the youngsters' manoeuvres in fine detail, Fashingbauer and Tuttle could also see that the oldest larvae (6.7–10.3 mm long) were able to accelerate up to speeds of 240 mm s^{-1}, while the youngest and smallest larvae still managed a respectable 160 mm s^{-1}, capturing their copepod treats in 9 ms. In addition, Tuttle and Lenz realised that the stealthy hunters depend on their pectoral fins to stabilise their body position by wafting them to and fro alternately as they creep forward before unleashing their powerful tail beat, unlike anchovy larvae, which continue beating their tails until the final push. Also, the youngest clownfish larvae appeared to target the youngest plankton larvae, whereas the more mature larvae graduated to consuming adult copepods.

'The combination of the clownfish's extreme J-shaped posture and alternate sculling of its pectoral fins likely minimises disturbance during its predatory approach while precisely aligning it with the prey', says Tuttle, explaining that the copepods are worthy adversaries, capable of making a rapid escape when they sense an approaching larva. And she suspects that the clownfish's lopsided strategy may represent one example of many possible alternative strategies adopted by larval fish in their progression to adulthood.

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Fashingbauer, M. C., Tuttle, L. J., Robinson, H. E., Strickler, J. R., Hartline, D. K. and Lenz, P. H. (2019). Predatory posture and performance in a precocious larval fish targeting evasive copepods. *J. Exp. Biol.* **222**, jeb191411.doi:10.1242/jeb.191411

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