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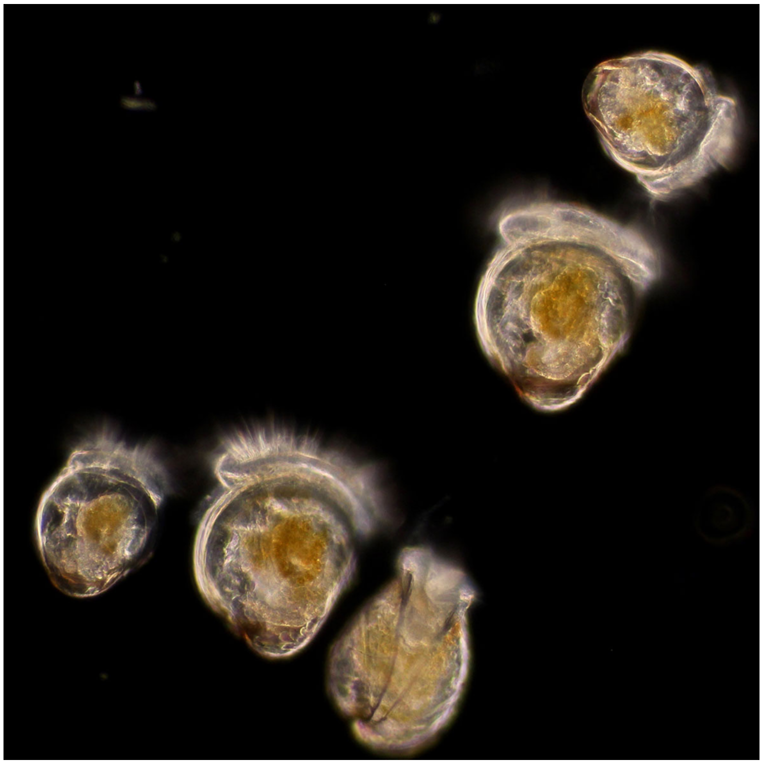
INSIDE JEB

Protein synthesis marks out fastest growing oyster larvae



Natural variation in body size of 11 day old sibling larvae of the Pacific oyster, *Crassostrea gigas*, grown under the same conditions. Photo credit: T.-C. Francis Pan.

Tiny oyster larvae are in a race to grow large enough to settle and find a permanent home or fall prey to the slightly larger creatures that are keen to consume them. However, the fastest growing youngsters probably pay a price for their accelerated start. They consume energy faster than more slowly growing larvae and these costs could rocket further as coastal water temperatures rise. As it is currently difficult to predict which larvae will get a growth head start, Donal Manahan and colleagues Francis Pan, Scott Applebaum and Christina Frieder from the University of Southern California, USA, embarked on a mammoth analysis of the factors that impact oyster larvae growth in an attempt to discover which ones allow large larvae to get ahead.

Having bred pedigree lines of oysters for a 10 year period, Manahan and his team interbred them to produce 12 families ranging from slow-growing small animals to rapidly growing large oysters. Once the team had established the growth rates of each family by measuring the shell lengths of over 7500 larvae, they monitored the protein synthesis rates, total protein and lipid content and metabolic rates of 24 million larvae as the animals grew over 17 days.

Observing a 430% difference in shell length across the 12 families, the team was impressed that the larvae recycled 86% of their newly synthesised proteins and that differences in the protein synthesis rates accounted for almost three-quarters of the larvae's growth differences. Also, when they analysed how much energy the fastest growing larvae allocated to protein synthesis, they were surprised that it accounted for 74% of the larvae's energy budget, whereas the slowest growing larvae only invested 22% of their energy in protein synthesis. 'This finding suggests that protein synthesis is a potential biomarker for the prediction of growth', says Manahan. However, he warns that the extraordinary growth rates of the fastest growing families leave their larvae with fewer reserves to deal with additional external stresses, suggesting that they may be the ones to get caught out if ocean acidification and rising temperatures continue apace.

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Pan, T.-C. F., Applebaum, S. L., Frieder, C. A. and Manahan, D. T. (2018). Biochemical bases of growth variation during development: a study of protein turnover in pedigreed families of bivalve larvae (*Crassostrea gigas*). *J. Exp. Biol.* **221**, doi:10.1242/jeb.171967.

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