New 'artificial selection' research findings signal threat for marine environments

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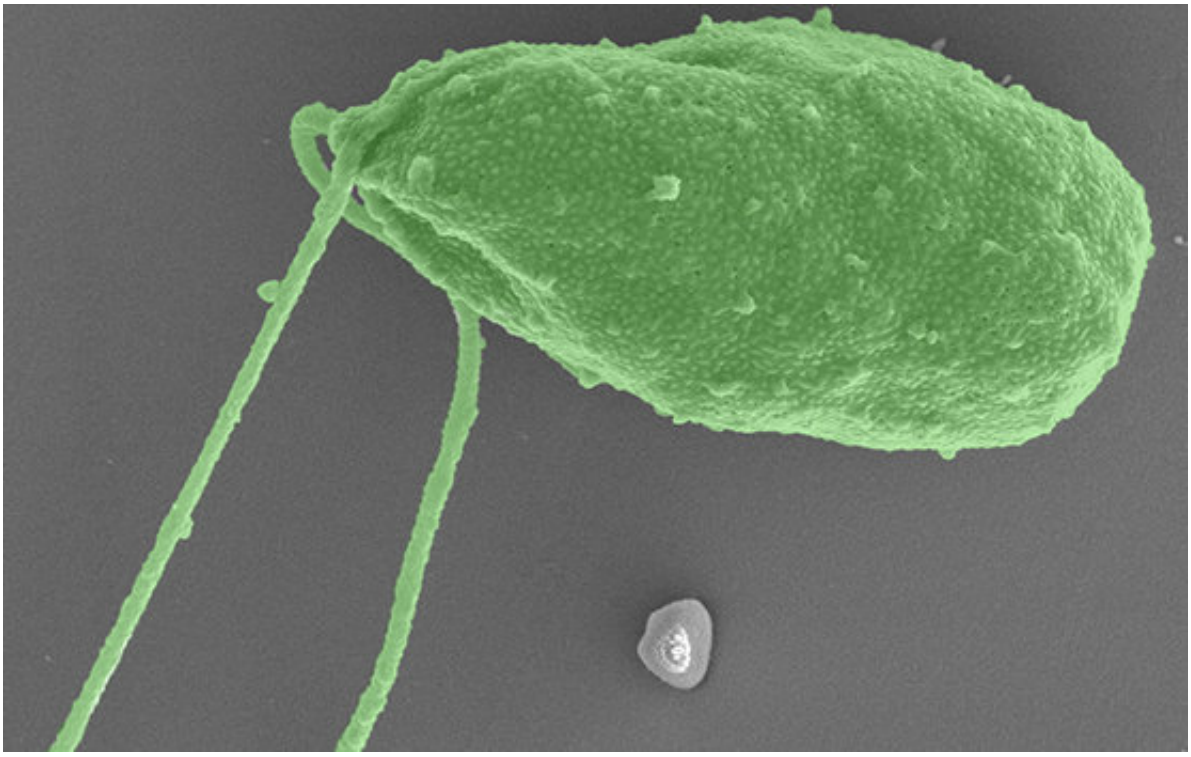

Scanning electron microscopy of a single-celled green microalga Dunaliella tertiolecta. Credit: Martino E. Malerba & Simon Crawford

A new study by Monash biologists has provided fresh insights into the long-standing questions of why animals are of the size they are and what happens when we artificially induce a change in their size.

Using a technique called 'artificial selection' the research team

genetically evolved small and large populations of a single-celled marine alga Dunaliella tertriolecta that differed in size by 500 percent. They then assessed physiological and ecological consequences of this size shift.

This research, published in the highly esteemed journal *Ecology Letters*, will influence the international debate on how natural ecosystems respond to human impacts.

"We are seeing rapid changes in animal body sizes around the world as a result of activities such as hunting and fishing, as well as climate change" said the study's lead author Dr Martino Malerba, from the Centre for Geometric Biology in the School of Biological Sciences.

"We found that populations consisting of a few large individuals grew faster than a population of equivalent biomass made up of many small individuals," he said.

"But this was only the case when resources (in this case light and nutrients) were plentiful, whereas when light was reduced the smaller algal populations performed better."

This research forms part of the larger research program underway in the Centre, which is developing new theories on how and why organisms grow.

What does this mean for the marine environment where organism size is decreasing? Most likely bad news, according to Dr Malerba.

"We calculated a four-times greater biomass production in populations of larger cells compared to the equivalent volume of smaller cells," he said.

"Evolving smaller body sizes can improve your ability to persist when resources are limited, but at a cost of lowered productivity."

"If the environment allows you to 'acquire too much', be big! Otherwise, better to 'desire little" and be little'."

Open oceans are the most productive systems in the world and single-celled algal species dominate this production. The study found that climate change can severely reduce this rate of carbon fixation by as much as 40 percent."

More information: Martino E. Malerba et al. Eco-energetic consequences of evolutionary shifts in body size, *Ecology Letters* (2017). DOI: 10.1111/ele.12870

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