

Scientists air new views on how oxygenation affects aquatic life

September 16 2011

Recent work at Plymouth University on how animals breathe underwater suggests that decreases in water quality and oxygenation will have an even greater impact on the diversity of aquatic life than was previously thought.

These are the exciting findings of Dr. Wilco Verberk and colleagues from Plymouth University who have made a significant breakthrough in understanding how <u>oxygen levels</u> in water affect the <u>diversity of life</u> in the world's oceans, lakes and rivers.

Dr Verberk and the team have developed a new index which accurately explains patterns in species richness and body size in both marine and freshwater ecosystems – and in doing so has reconciled previously conflicting approaches.

Despite the fundamental importance of oxygen, up until now scientists haven't agreed on what limits oxygen supply to cold-blooded animals breathing underwater: the effect of atmospheric pressure versus oxygen solubility related to temperature.

Dr Verberk explained: "Physiologists emphasize oxygen partial pressure, which is down to air pressure, and changes with altitude. Conversely, ecologists emphasize oxygen solubility, the amount dissolved in the water, traditionally expressing oxygen in terms of concentrations. Studies using one or other of these measures lead to very different conclusions on how oxygen drives patterns in species richness and body size such as



those seen with latitude or along altitudinal gradients.

"Instead of one or the other being important, the amount of oxygen available to an aquatic animal is actually determined by both the amount dissolved in the water (its solubility) and the partial pressure, as well as the rate of diffusion."

The research, published in *Ecology*, reveals that there is actually more oxygen available in warmer habitats, something which runs contrary to established wisdom. It turns out that as their habitat warms up, aquatic animals experience oxygen shortage not because less is available, but because their oxygen requirements increase faster than the rate of increase in oxygen availability - as metabolic rate increases, demand outstrips supply.

Dr Verberk said: "Our discovery that oxygen availability is actually higher in warmer habitats, represents a significant shift in our understanding of how <u>oxygen</u> shapes aquatic communities and has major implications for our theories of how and why <u>animals</u> are limited by temperature, as well as our ability to predict the impacts of climate change.

"Any decline in <u>water quality</u> and in particular oxygenation, could greatly exacerbate climate change effects."

Provided by University of Plymouth

Citation: Scientists air new views on how oxygenation affects aquatic life (2011, September 16) retrieved 28 April 2024 from <u>https://phys.org/news/2011-09-scientists-air-views-oxygenation-affects.html</u>

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