SUBLETHAL EFFECTS OF HYPOXIA IN MACROINVERTEBRATES
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Introduction

Consequences of human activities, including nutrient input from agriculture and global warming, are already impacting global ecosystems (Stocker et al. 2012; Breitburg et al. 2009). Nutrient input to aquatic ecosystems is the primary cause of hypoxia (Diaz 2001).

Hypoxia is the condition where environmental oxygen supplies are deficient, but unlike in anoxia, still present in the system.

Increasing temperatures decrease the solubility of many gases in water—including oxygen (Sander 2014); global warming is thus expected to exacerbate exposure and adverse effects of many organisms to hypoxic conditions (Vaquer-Sunyer and Duarte 2008).

Aquatic food webs largely depend on macroinvertebrate species that have a high biomass production.

In this study, we looked at sublethal effects of hypoxia on various macroinvertebrates by conducting a literature review.

Methods: literature search and data analysis

We looked for relevant published studies on Google Scholar, Scopus, and JSTOR.

Relevant studies described sublethal effects of hypoxia on the following processes: growth (changes in body length and mass), reproduction, feeding and respiration (amount of consumed oxygen). Several studies examined a range of organisms (Sander 2014), including oxygen (Sander 2014); global warming is expected to exacerbate exposure and adverse effects of many organisms to hypoxic conditions (Vaquer-Sunyer and Duarte 2008).

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Results

Our literature search yielded 51 relevant studies out of which 14 investigated impacts hypoxia (and temperature) on growth, 11 on feeding, 8 on fecundity, and 17 on respiration (results not shown). We looked for both effects of oxygen (blue line) and both oxygen and temperature (red line).

Amount of oxygen has a positive effect on feeding of tested organisms (p = 2.2 × 10⁻⁴) (Figure 1).

Data on growth was separated to growth in length (Figure 2) and growth in mass (Figure 3). Both were significantly affected by the level of oxygen and temperature, but growth in mass much less so (p = 0.002679) when compared to growth in length (p = 2.2 × 10⁻⁴).

Fecundity was also affected significantly by oxygen and temperature (p = 1.486 × 10⁻⁴).

References


R foundation. 2015. R programming language ver. 3.2.1.


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