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The effects of dietary *Microcystis aeruginosa* and microcystin on the copepods of the upper San Francisco Estuary

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[Anatomy, Physiology and Cell Biology](#)

Research output: Contribution to journal > Article

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Citations

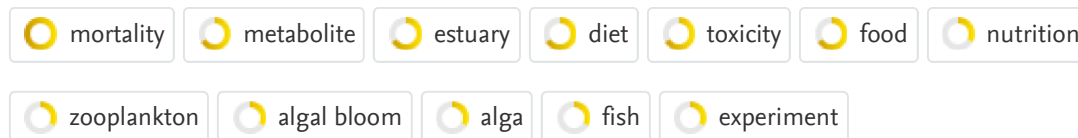
Abstract

1. Increasing blooms of *Microcystis aeruginosa* have unknown impacts on the copepods *Eurytemora affinis* and *Pseudodiaptomus forbesi*, which are the dominant zooplankters and key prey species for endangered larval fish in the upper San Francisco Estuary. 2. Laboratory feeding experiments were designed to measure the effect of *Microcystis* on copepod survival and to distinguish the effects of toxicity and nutrition. In a series of survival tests, copepods were fed a mixed diet of algae plus one of two strains of *Microcystis*, either producing (MC+) or lacking microcystin (MC-). 3. *Microcystis* significantly reduced survival even when it was a small proportion of the diet, indicating that toxicity was the major cause of mortality. Contrary to expectation, however, the MC+ strain did not result in higher mortality, suggesting that non-MC metabolites of *Microcystis* can be toxic to copepods. 4. Across treatments, survival of *P. forbesi* was greater than that of *E. affinis*, although the two copepods responded differently to both the ratio and the strain of *Microcystis* in their food. Survival of *P. forbesi* was greater on the MC+ strain and was inversely proportional to the ratio of dietary *Microcystis* (MC+ or MC-). In contrast, survival of *E. affinis* declined similarly across treatments and was not related to

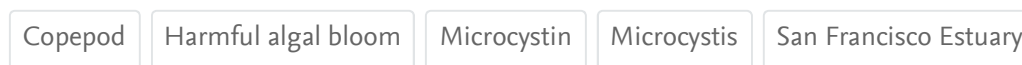
the proportion or strain of dietary *Microcystis*. Results indicate that the copepod *P. forbesi* can coexist with *Microcystis* while the other copepod *E. affinis* cannot.⁵ Regardless of species, dietary *Microcystis* caused significant mortality to copepods, and it may cause adverse impacts to the potentially food-limited zooplankton community of the San Francisco Estuary. These impacts may not be related to the cellular MC concentration because *Microcystis* contains other metabolites that negatively affect copepods. © 2010 Blackwell Publishing Ltd.

ORIGINAL LANGUAGE	English (US)
PAGES (FROM-TO)	1548-1559
NUMBER OF PAGES	12
JOURNAL	Freshwater Biology
VOLUME	55
ISSUE NUMBER	7
STATE	Published - Jul 2010

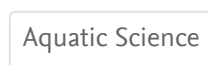
Fingerprint



Keywords



ASJC Scopus subject areas



Cite this



Ger, K. A., Teh, S. J., Baxa, D. V., Lesmeister, S., & Goldman, C. R. (2010). The effects of dietary *Microcystis aeruginosa* and microcystin on the copepods of the upper San Francisco Estuary. *Freshwater Biology*, 55(7), 1548-1559. DOI: [10.1111/j.1365-2427.2009.02367.x](https://doi.org/10.1111/j.1365-2427.2009.02367.x)

Access to Document

[10.1111/j.1365-2427.2009.02367.x](https://doi.org/10.1111/j.1365-2427.2009.02367.x)

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