Cyanobacteria as a carbon source for zooplankton in eutrophic Lake Taihu, China, measured by ^{13}C labeling and fatty acid biomarkers

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Limnol. Oceanogr., 57(4), 2012, 1245-1254 | DOI: 10.4319/lo.2012.57.4.1245

ABSTRACT: Using a combined stable-isotope and fatty-acid approach, we examined carbon-transfer routes from the cyanobacterium *Microcystis* to zooplankton in eutrophic Lake Taihu, China. *Microcystis* is generally considered poor food for zooplankton, and we hypothesized that most *Microcystis* carbon flows to zooplankton via dissolved organic matter (DOM)-bacteria and detritus-bacteria pathways rather than via direct grazing. The hypothesis was tested by analyzing ^{13}C isotopes at natural abundance in field samples and in tracer experiments with ^{13}C-enriched *Microcystis*. ^{13}C-enriched *Microcystis* was added as live *Microcystis*, *Microcystis* detritus, or *Microcystis* DOM to lake-water incubations with *Bosmina* sp. and *Daphnia similis* as the dominant species. The ^{13}C isotope signatures of *Microcystis*, heterotrophic bacteria, and eukaryotic algae in seston were determined from isotope analyses of specific fatty acids, and the presence and labeling of these fatty acids were also analyzed in zooplankton consumers. *Bosmina* and *Daphnia* consumed carbon via all pathways, but the amount of carbon transfer from the *Microcystis* DOM was the highest, followed by the *Microcystis* detritus. *Bosmina* consumed relatively more live *Microcystis* than *Daphnia*. The presence and high ^{13}C enrichment of bacteria-specific fatty acids in the zooplankton consumers showed that heterotrophic bacteria were an important link between *Microcystis* and zooplankton. Microbial pathways dominate the energy flow from cyanobacteria to zooplankton in eutrophic lakes with heavy cyanobacteria blooms, such as Lake Taihu.