Daphnia fatty acid composition reflects that of their diet

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ABSTRACT: We conducted a series of experiments feeding *Daphnia pulex* nine different phytoplankton monocultures with widely varying fatty acid composition and nutritional values to test the extent to which Daphnia fatty acid composition was affected by diet. In general, *Daphnia* fatty acid composition matched that of their diet much more closely than it did the fatty acid composition of *Daphnia* consuming other diets. However, *Daphnia* had consistently less saturated fatty acids and more arachidonic acid than did their diet, and *Daphnia* consuming cyanobacteria had substantially less saturated fatty acids and more monounsaturated fatty acids than their diets. *Daphnia* that consumed cryptophytes, which are rich in ¤3 polyunsaturated fatty acids (PUFAs), had on average 47% ± 8% (61 SD) ¤3 PUFAs within their fatty acid pool, whereas *Daphnia* that consumed ¤3 PUFA-poor cyanophytes only had 6% ± 3% ¤3 PUFAs. The ratio of ¤3 to ¤6 fatty acids in *Daphnia* was also strongly dependent on diet, and averaged ~ 10 : 1, 2 : 1, and 1 : 1 for *Daphnia* that consumed cryptophytes, chlorophytes, and cyanophytes, respectively. Furthermore, the sum of C_{20} and C_{22} ¤3 and ¤6 fatty acids in *Daphnia* was highly correlated with that of their diet (r^2 = 0.94). These results suggest analyses of *Daphnia* fatty acid composition may be a powerful means of inferring diet in the field. These results also suggest the nutritional benefits of consuming ¤3-rich phytoplankton will transfer up the food web, making zooplankton both more efficient at converting phytoplankton biomass to their own biomass as well as much more nutritious for the zooplanktivorous fish that consume them.

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