STRESSOR EFFECTS ON AQUATIC FOOD WEB FUNCTIONING: METHODOLOGY AND CASE STUDY

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The status of natural marine ecosystems and how they respond to and recover from exposure to stressors is often assessed by monitoring the population size of individual species using field surveys. Although this approach reveals which food web components are abundant, it provides little information on food web functioning. Here, we present a new approach that uses carbon budget estimation techniques to establish stressor effects on food web functioning from monitored population sizes. We applied this methodology to a data set from an enclosure experiment in which a single anthropogenic stressor, the insecticide cypermethrin, adversely affected the zooplankton community and provoked a phytoplankton bloom. Our model showed that protozoa benefited most from this bloom, i.e. they gradually shifted from 60-90% bactivory in the control to 60-90% planktivory at 3.6 µg L^{-1} cypermethrin. At this concentration, protozoa made up 50% of the copepod diet while in the control, copepods were strictly herbivorous. Network analysis revealed that the increasing dependence of food web functioning on one compartment (protozoa) rendered the food web less stable and thus more vulnerable for future disturbances. We conclude that our approach is an excellent tool to analyse the available monitoring data sets that contain the population size of individual species as a function of pollution gradients.