The effects of a catastrophic pesticide spill on the River Kennet

An update

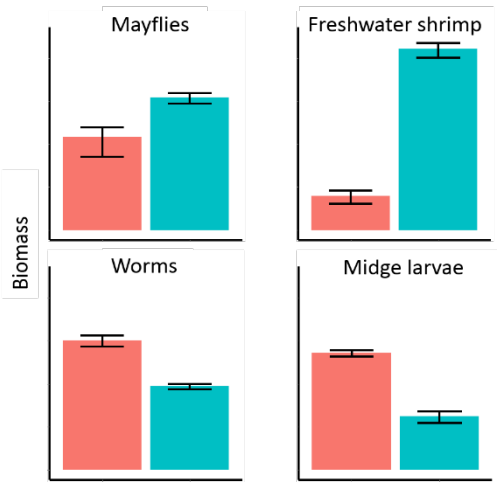




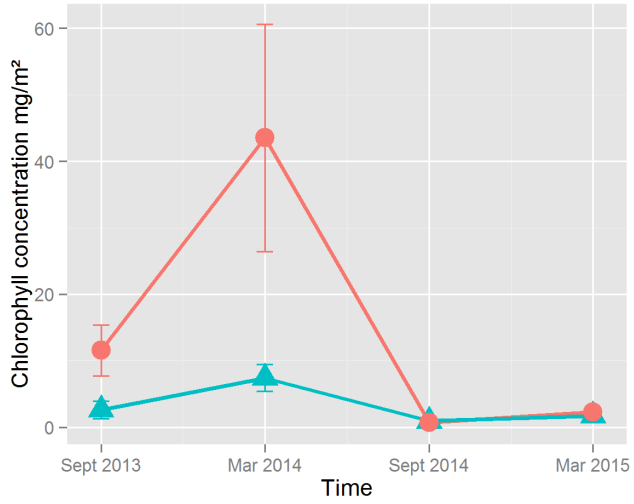
This autumn saw the end of our planned fieldwork on the River Kennet, a fieldwork campaign during which we have collected 700 invert samples, scraped the surface of 4,200 rocks for algae samples, weighed and measured 4,070 fish and deployed 1,400 leaf litter decomposition bags. We have been busy in the lab too, for instance to date we have measured 11,969 invertebrate individuals. We now have a whole room dedicated to storing all the samples we have taken!

None of this would have been possible without the help and support of Action for the River Kennet including Charlotte Hitchmough, Harry Forbes, Kevin Light and Joe Phillips among others, Savernake Flyfishers, John and Rob Hounslow, Marlborough College and Ivor Dunbar, the Environment Agency, specifically Adam Hilliard, John Sutton and Jonathan Baxter. Every stage of this project has required huge amounts of collaboration and we are so grateful to everyone for their help.

Our initial data collected in July and September 2013 is pretty clear, for instance the graph on the right shows the effect on invertebrate species at the impacted sites (in red) as compared to the control sites above the spill (blue). Species which are sensitive to insecticides were negatively affected, for instance the biomass of mayflies and freshwater shrimp, both of which are important for the health of the river ecosystem, was dramatically reduced. On the other hand, some species benefited from the pesticide, worms increased their biomass, possibly because they were able to take advantage of the reduced competition with pesticide sensitive invertebrates. Midge larvae were also increased their biomass two months after the spill, we think this might be because they have very

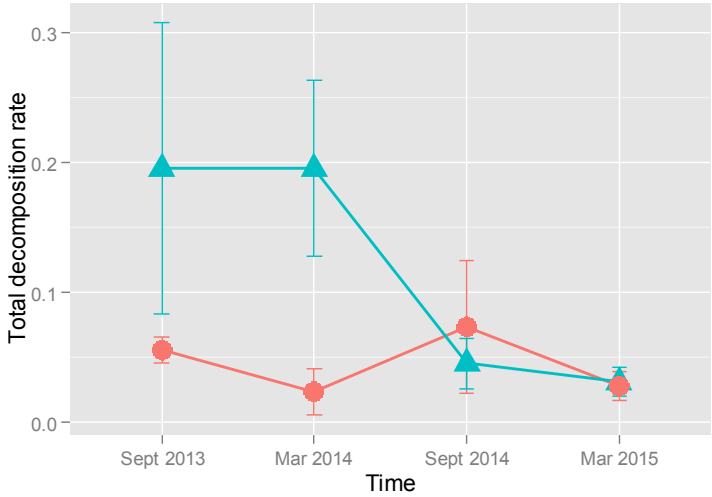


short generation times and were able to recover very quickly after the spill and take advantage of the reduced competition.



The pesticide also affected the algae in the river, the graph on the left shows how the concentration of chlorophyll - the green pigment in plants responsible for photosynthesis changes over time after the spill. At sites below the spill (in red) the concentration of chlorophyll is at first higher than that at the control sites (in blue) but then decreases and becomes the same as the control by one year after the spill. This was most likely because the pesticide spill killed almost all the insect life which would normally be feeding upon the algae in the impacted sites. The death of the insects released the algae from grazing pressure and allowed them to put on significant growth.

We have also investigated how leaf litter decomposition rates have changed since the spill. The rate of decomposition at sites affected by the spill (in red) was far lower than rates at the control sites (in blue). After a year though the decomposition rate at the impacted sites had gone recovered and was the same as rates at control sites. This was most likely due to the primary invertebrate decomposer, Gammarus shrimp, being killed by the pesticide. The rate of decomposition has recovered, but slowly due to the limited ability of this species to re-colonise.



Future work

Earlier this year we published our first paper from this project which summarises the initial impacts of the spill;

Thompson, M. S. A., Bankier, C., Bell, T., Dumbrell, A. J., Gray, C., Ledger, M. E., Woodward, G. (2015). **Gene-to-ecosystem impacts of a catastrophic pesticide spill: testing a multilevel bioassessment approach in a river ecosystem.** *Freshwater Biology*, doi:10.1111/fwb.12676

This will soon be open access and available to download for free. We are now working on the next stage of the project which is to understand how the river has recovered. When we have completed processing the samples we have collected from the Kennet we will have a truly unique and powerful dataset with which to understand the resilience of river ecosystems to stressors such as pesticides. We will of course keep you up to date with developments, and hope to see you on the river again soon!