Rapid re-colonisation of river after extreme flood

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After being virtually eliminated during a flood in 2005 in Wolf Point Creek, Alaska, salmon, meiofauna and most macroinvertebrates all re-colonised within two years, according to research led by Sandy Milner, and published recently in the journal Nature Climate Change.

During the flood over 400mm of rain fell over a four day period with 130mm falling on a single day on top of recent snowfall. The intensity of the rainfall indicated that this event was a one in a hundred year occurrence. The channel almost halved in width and deepened by up to a metre. Extreme flood events of this nature are becoming more common with climate change.

The team (which included the Universities of Leeds and Roehampton) had previously studied salmon populations and macroinvertebrate and meiofauna communities in Wolf Point over a 28 year period as the stream developed following ice recession, providing them with a unique long term dataset prior to the flood in 2005. They were then able to use these data to compare with the taxa that started to recolonize and recover in the river after the flood.

Responses to flood events are dependent on the organism's resistance, it's ability to withstand a disturbance, and resilience, it's ability to recover from disturbance.

Pink salmon, whose cohort of eggs was virtually wiped out in the flood, returned to the stream in 2007 in very low numbers, less than 500. Four years later their numbers had recovered to pre-flood levels to more than 15,000. Juvenile silver salmon also recovered rapidly. This demonstrated the resilience of salmon populations to major disturbances if a small number of the population survives.

The macrointertebrate community structure was significantly different after the flood, as some of the earlier colonisers which had become extinct pre-flood were able to recolonise as later colonisers were eliminated. The Dytiscidae beetles, freshwater shrimp Gammarus and the caddisfly Ecclisomyia were lost from the community and had not recolonised by 2008, but the overall taxa richness was not influenced markedly by the flood. Some pioneer species such as the midge larvae Diamesa, which had gone extinct 13 years earlier, were able to recolonise in the stream due to less competition from other organisms post-flood.

Meiofaunal abundance (small animals of less than 1 millimetre) immediately increased post-flood. These organisms found it easier to re-colonise, because some of the sediment was removed during the flood, as they favour interstitial spaces within the substrate without sediment.

The study has provided insights into the resistance and resilience of riverine communities to major flood events, with body size considered a major contributing factor. Larger bodied juvenile salmon and some macroinvertebrates showed lower resistance but high resilience, whereas smaller bodied meiofauna showed both high resistance and high resilience. Biotic recovery was independent of geomorphic recovery.

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