

Recovery of a tropical stream after a harvest-related chlorine poisoning event

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SUMMARY

1. Harvest-related poisoning events are common in tropical streams, yet research on stream recovery has largely been limited to temperate streams and generally does not include any measures of ecosystem function, such as leaf breakdown.
2. We assessed recovery of a second-order, high-gradient stream draining the Luquillo Experimental Forest, Puerto Rico, 3 months after a chlorine-bleach poisoning event. The illegal poisoning of freshwater shrimps for harvest caused massive mortality of shrimps and dramatic changes in those ecosystem properties influenced by shrimps. We determined recovery potential using an established recovery index and assessed actual recovery by examining whether the poisoned reach returned to conditions resembling an undisturbed upstream reference reach.
3. Recovery potential was excellent (score = 729 of a possible 729) and can be attributed to nearby sources of organisms for colonisation, the mobility of dominant organisms, unimpaired habitat, rapid flushing and processing of chlorine, and location within a national forest.
4. Actual recovery was substantial. Comparison of the reference reach with the formerly poisoned reach indicated: (1) complete recovery of xiphocaridid and palaemonid shrimp population abundances, shrimp size distributions, leaf breakdown rates, and abundances of oligochaetes and mayflies on leaves, and (2) only small differences in atyid shrimp abundance and community and ecosystem properties influenced by atyid shrimps (standing stocks of epilithic fine inorganic and organic matter, chlorophyll *a*, and abundances of chironomids and copepods on leaves).
5. There was no detectable pattern between any measured variables and distance downstream from the poisoning. However, shrimp size-distributions indicated that the observed recovery may represent a source-sink dynamic, in which the poisoned reach acts as a sink which depletes adult shrimp populations from surrounding undisturbed habitats. Thus, the rapid recovery observed in this study is consistent with results from other field studies of pulse chlorine disturbances, harvest-related fish poisonings, and recovery of freshwater biotic interactions, but it is unlikely to be sustainable if multiple poisonings deplete adult populations to the extent that juvenile recruitment does not offset adult shrimp mortality.

Keywords: Decapoda, macroinvertebrates, Puerto Rico, pulse disturbance, shrimps, toxic release

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Introduction

Most studies of stream ecosystem disturbance and recovery have examined measures of ecosystem structure, such as species- or community-level indicators (Fisher, 1990; Yount & Niemi, 1990). In contrast,