

EFFECTS OF SEWAGE PLANT POLLUTION ON CRAYFISH IN THE JUNIATA RIVER

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ABSTRACT

Prior research has suggested that the Huntingdon sewage plant has adverse effects on crayfish populations in the Juniata River. As previously found, crayfish were more numerous above the discharge point of the sewage plant than at and downstream from the discharge point. The decline in crayfish number at and below the plant discharge point suggests that the plant is discharging harmful unknown pollutants into the river.

Keywords: Crayfish, pollution, populations, river ecology

INTRODUCTION

We tested whether the effluent of the Huntingdon sewage treatment plant affected the abundance of crayfish in the Juniata River, as a follow-up to a similar study by Watson (2000). Studies such as this are important, as we need to understand the effects of our actions and our waste products on organisms in our natural environment. Through such information we can correct our means of production or waste disposal so that we do not destroy our waterways. Waterway degradation could have a significant impact not only on aquatic life but the ability of humans to use the water. We wanted to test the effects of a local sewage treatment plant on an organism, such as the crayfish, that is known to withstand moderate amounts of pollution and that can serve as 'bioassay' of water quality. We hypothesized that crayfish would be most abundant in the area above the sewage-plant discharge, most rare in the vicinity of the discharge, and intermediate in abundance below the discharge (as observed by Watson 2000).

FIELD SITE

This study was done at 3 sites in the vicinity of the Huntingdon sewage treatment plant. Site 1 was about 250 m upstream of the discharge pipe. Site 2 was in the river at the discharge pipe to about 30 m downstream. Site 3 was about 500 m downstream of site 2. The test area lies about 1.6 km outside Huntingdon. All sites have a similar substrate of gravel with numerous rocks between 6 to 60 cm in diameter, as well as a few larger rocks.

METHODS AND MATERIALS

Crayfish (of unknown species) were collected using a 2-m by 1.2-m seine. Two people held the seine outstretched in the water, while a third person 2 m upstream kicked the substrate left and right and toward the seine for 1 minute. Each sample encompassed a 4-m² area per sample. Five samples were taken per site on April 6, 2001, and 10 samples were taken on April 24, 2001, for a total of 15 samples per site. A Kruskal-Wallis test was used to test for differences in abundance among the 3 sites.

RESULTS

Number of crayfish varied significantly among the 3 sample sites ($H = 9.71$, $df = 2$, $P = 0.008$). The total crayfish collected and mean number collected per sample (\pm SD) at each site were as follows: site 1: 55, 3.66 (\pm 3.68); Site 2: 13, 0.866 (\pm 0.833; and Site 3: 32, 2.13 (\pm 1.51).

DISCUSSION

Our spring 2001 results support Watson (2000) who also found that, in autumn 2000, crayfish were less abundant at the point of discharge of the Huntingdon sewage plant (only 1 collected) than upstream (34 collected) and downstream (25 collected) in the Juniata River. Both of these studies suggest that there is some form of pollution emanating from the Huntingdon sewage plant that is having a negative effect on crayfish in the Juniata River. However, our study does not tell us what specific pollutant(s) is involved nor whether the effect is on the crayfish themselves or their food source. A laboratory-based toxicology experiment would be required to determine what is actually causing the population decline. One item of interest that we noted while doing this study was that there seemed to be a small population of stonefly larvae (which are notoriously pollution sensitive) at the site 500 m downstream (site 3), but far fewer above and at the discharge point for the sewage plant (sites 1 and 2). This pattern suggests opportunities for further research to see if there is an effect of the sewage plant on other macroinvertebrates, and whether sewage-related pollutants affect crayfish more or less than typically pollution sensitive stoneflies.

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LITERATURE CITED

Watson, A.D. 2000. An assessment of the effect of the Huntingdon and Smithfield Sewer Plant on the crayfish population in the Juniata River. Unpublished report, Juniata College, Huntingdon, Pennsylvania, USA.