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Reintroduction of large woody debris in navigable rivers: a pilot study to stimulate biodiversity within safety constraints

Improvement of aquatic biodiversity

Large woody debris (LWD) has been introduced into a navigable river system as a pilot measure.

Within the same year fish and macro-invertebrate densities multiplied.



Introduction

Since riparian forests have become rare and LWD is actively removed from the water, this natural structure is nowadays missing in our rivers. Reintroduction of LWD has proved to be a successful measure in many smaller river systems. It provides habitat for both fish and macro-invertebrates.

Rijkswaterstaat has started a pilot study to apply LWD in the river Rhine to investigate the contribution of LWD to the goals of the Water Framework Directive (WFD) in large rivers.

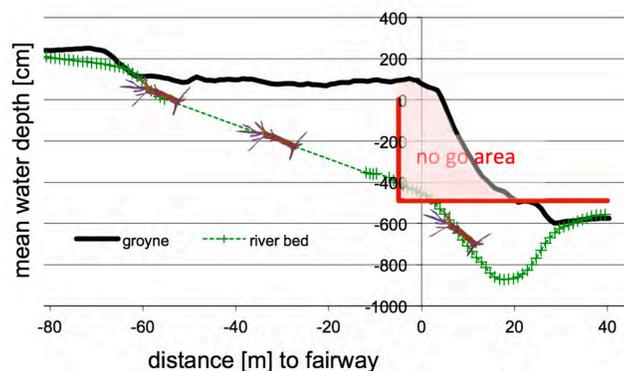
Methods



- It is important that the LWD stay in position, even during high flood periods. Determining the appropriate fixing method was therefore also an important part of this pilot study.



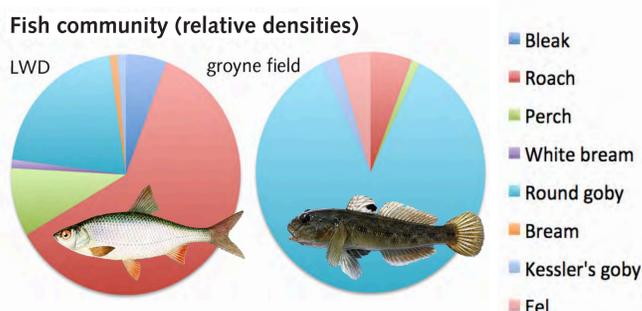
- The pilot study was carried out at twelve locations in the river Rhine that differed in water depth, stream dynamics and wave exposure.
- LWD in the form of six trees, including branches and roots, were attached to steel beams just under the water surface near the banks in the main channel, a side channel and a fishway.



- Six trees were placed at different depths in deep erosion pits near the groynes.

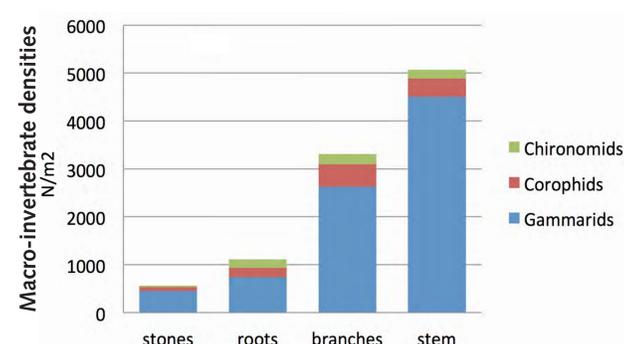
We selected sites that are deep enough under all circumstances and at sufficient distance from the navigation channel. These trees were attached to large concrete slabs.

Monitoring biodiversity



Fish surveys were based on fyke nets and electrofishing complemented with underwater video surveys. In the shallow locations large concentrations of juvenile fish were observed, especially near the branches. The fish community in the groyne fields was dominated by Round goby, an exotic species. The fish community near the LWD was more diverse and dominated by indigenous species.

For complete macro-invertebrate sampling, one entire tree was lifted from the fishway. A total of ca. 100,000 individuals was collected. The stem contained the largest densities: over 10 times more than on stones of the fishway bed. At least 12 chironomid species were found that are new or rare in the river Rhine. The most abundant species were common though and not specific to streams.



Conclusion

Preliminary results indicate that LWD is important as habitat for fish and macro-invertebrates in impounded branches of the river Rhine. If future monitoring results confirm that LWD contributes to biodiversity in navigable rivers and the fixation methods remain adequate, the measure will be exported to free flowing rivers. These are clear steps towards the ecological goals of the WFD.

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