



Universiteit
Leiden

The Netherlands

River soundscapes: the human-altered acoustic world of migratory fish

Velde, K. te

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Stellingen behorende bij het proefschrift
River Soundscapes
The human-altered acoustic world of migratory fish

1. Freshwater systems may be especially vulnerable to noise pollution compared to marine systems because of their low ambient sound levels and auditory sensitivity of many freshwater species (CH2).
2. Among anthropogenic noise sources, road traffic noise is the most spatially widespread in freshwater systems (CH3).
3. River estuaries, crucial for migratory fish, are also hotspots of anthropogenic noise, potentially posing significant barriers to migration (CH4).
4. Rather than limiting scientific insight, tank acoustics can be leveraged to study mechanisms that are more difficult to investigate in field conditions (CH5).
5. Integrating natural sound cues and minimizing anthropogenic noise should be part of the design of effective fish passages (CH6).
6. Quantifying natural soundscapes through field recordings is essential to understand the ecological relevance of noise impacts on animals.
7. Anthropogenic noise often leads to deterrence of fish but rarely attraction, while natural sounds can cause both deterrence and attraction.
8. Noise monitoring and mitigation measures should be incorporated in freshwater international policy documents such as the Water Framework Directive of the European Union.
9. Passive Acoustic Monitoring is a promising and underutilized tool for the study of biodiversity and animal behaviour in freshwater systems.
10. Greater attention should be given to the effects of noise on aquatic insects, which play an important role in aquatic ecosystems, can be used as indicator species, and many make use of acoustic communication.
11. Bioacousticians should collaborate more with sound artists, as art connects sound to emotion, it can help bridge the gap between science and society.
12. A PhD-project is a good time to have kids.

Kees te Velde
Leiden, 13 mei 2026