

Amongst vertebrates, fishes have evolved a unique diversity in sound producing and detecting mechanisms. Amazonian waters reveal the highest species diversity in freshwater fishes worldwide, and the vast majority of Amazonian fishes belongs to the Otophysi. In otophysan fishes the swim bladder is connected to the inner ears via a chain of tiny ossicles, resulting in highly improved hearing capacities. Many of the Amazonian fishes, for example numerous catfishes, piranhas and pacus are also able to produce communication sounds. Considering the diversity in hearing abilities and sound production in fishes, our current knowledge in fish bioacoustics, however, is still rather limited. Many questions related to hearing, sound communication, the evolution of different hearing abilities, and effects of natural and anthropogenic noise on fishes are still unanswered.

In cooperation with scientists from Brazil and Belgium, I plan bioacoustical studies on catfish species from the families Auchenipteridae, Callichthyidae, Cetopsidae, Doradidae, Heptapteridae, Pimelodidae, Trichomycteridae, and from a group of catfishes incertae sedis which show challenging ways of life in underground waters and on land. Furthermore, several characiform serrasalmids will be studied, including carnivorous piranhas and herbivorous pacus. The research institute INPA in Manaus, near to the confluence of Amazon and Rio Negro, will be the basis for our field studies.

We will record fish sounds in the natural habitats and in aquaria, ambient biotope noise, and ship noise produced by boats typical for these regions. Hearing abilities of study species will be tested in the lab under varying noise conditions to evaluate effects of noise on sound detectability. Furthermore, we plan detailed anatomical studies in structures involved in hearing and sound production. We will additionally conduct behavioural experiments with some species, for example bloodsucking catfishes, to test sound as possible factor for prey detection.

Our studies will add basic knowledge to hearing, sound production and related anatomy of so far unstudied representatives of serrasalmids and the highly diverse catfishes, and we will give an overview of soundscapes in the various types of freshwater habitats around Manaus. Furthermore we intend to answer questions in evolutionary and behavioural biology, such as on effects of different diets on hearing in serrasalmids, on effects of habitat noise on hearing capacities of resident fish species, and on use and detectability of fish communication sounds. Last but not least, our studies will be the first to examine effects of man-made noise on Amazonian fishes. Changes in acoustic sceneries of waters, caused by changes in river regimes or human activities such as shipping, affect their residents. Yet, these factors have not been considered in Brazilian conservation and fisheries management plans. The outcomes of this project will also demonstrate the impact of anthropogenic noise on fishes in this worldwide unique ecosystem.