# THE WEBERIAN APPARATUS IN ACTION – HOW DO THE AUDITORY STRUCTURES OF OTOPHYSAN FISHES INTERACT DURING SOUND EXPOSURE?

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The otophysans are a speciose group of modern bony fishes (10,350 species), which possess improved auditory abilities. Improved hearing in these fishes is correlated to a unique type of connection between the swimbladder and the inner ears, namely the Weberian apparatus. The Weberian apparatus consists of soft tissue elements such as the sinus impar and the interossicular ligaments as well as the Weberian ossicles; the latter can also be preserved in fossil specimens. Until now, it remains widely elusive, which selective pressure(s) may have driven the evolution of this complex structure. Approaching questions on how the Weberian apparatus has evolved are tightly linked to a profound understanding of how the auditory structures in extant otophysans work together and what factors may affect their function. Despite the well-investigated morphological diversity of the auditory structures in otophysans, hypotheses on the function of the Weberian apparatus formulated decades ago still await experimental testing. To tackle this issue, we are currently developing a 4D tomography approach at the TOMCAT beamline of the Swiss Light Source. The synchrotron radiation-based tomography using high spatio-temporal resolution allows quantifying the motion patterns of the auditory structures in 3D. So far, we have subjected individuals of the glass catfish *Kryptopterus vitreolus* in a miniature standing wave tube-like setup to 350 and 450 Hz pure tone stimuli. First results indicate that we are able to successfully visualize and quantify the *in-situ* motion patterns from the swimbladder through the Weberian ossicles to the otoliths of the inner ears. In a next step, we will compare the motion patterns in cypriniform and silurifom species differing in the morphology of the swimbladder and the number of the Weberian ossicles. In a long run, our results should provide the basis for modeling the motion of Weberian apparatus-like structures in well-preserved fossil specimens.