AbyssBox: public exhibition of deep-sea hydrothermal fauna and associated research projects

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The AbyssBox project aims to provide the first permanent public exhibition of live deep-sea hydrothermal fauna maintained at in situ pressure. The pressurized aquarium 'AbyssBox' is exposed since 2012 at Océanopolis in Brest, France. Deep-sea vent specimens have now been kept for several years in captivity, namely the shrimp Mirocaris fortunata and the crab Segonzacia mesatlantica that were sampled from 1700m depth at the Lucky Strike vent field (Mid-Atlantic Ridge). Primarily designed for a public exhibition, AbyssBox is already used for scientific purposes, since it provides one of the most effective tools for long-term rearing of deep-sea fauna. The access to deep-sea alive shrimp year-round in captivity created, among others, the opportunity for study of their sensory perception. Endemic vent shrimp may use the chemical signature of hydrothermal fluids to locate active edifices, but despite the fact that the antennal appendages may play a major role in the detection of their environment, there is still little information about their chemosensory sensitivity. We recorded the global antennal appendages activity of the vent shrimp M. fortunata to diverse environmental stimuli, by developing a dedicated underwater electroantennography (EAG) method. We also made a comparative description of the antennal appendages of 4 hydrothermal vent shrimp (Rimicaris exoculata, Mirocaris fortunata, Chorocaris chacei, and Alvinocaris markensis) and a related coastal shrimp (Palaemon elegans). This combined morphological and functional approach provides insights into deep-sea vent shrimp olfaction, and ultimately in the potential adaptations of the sensory organs to their peculiar environment.