



Ship Noise: a significant Stress Factor for Freshwater Communities

A recent Austrian study confirms that exposure to underwater noise pollution is a major source of stress for freshwater fish. The results show that ship noise can increase the secretion of stress hormones in fish by up to 120% in comparison with a no-noise situation. The authors emphasise that this biological response to man-made noise can have severe impacts on the growth and development of fish.

During the last decade, much effort has been dedicated to researching the impacts of man-made noise on the physiology, communication and reproduction of terrestrial animals and more recently research has started to also investigate the impacts on aquatic organisms, such as marine mammals and fish. Scientists have shown that noise can temporarily impair animals' hearing, thus possibly altering essential functions such as the detection of predators and prey. Other studies have also identified biological responses to stress, especially for mammal species. To date, there has been little focus on the response to noise of freshwater systems. Nevertheless, anthropogenic activities such as commercial shipping, recreational activities, drilling, seismic exploration and energy production have made underwater noise an increasing problem in the aquatic environment. However, responses to man-made noise had almost exclusively been investigated in the marine environment and in relation to seismic exploration.

Austrian researchers have recently investigated whether, and to what degree, the dynamic and unpredictable characteristic of ship noise is a stress factor for fish. To this end, they studied the hormonal responses of fish to underwater ship noise. The level of cortisol secretion was chosen as an indicator of stress in fish, as the production of this hormone increases as stress levels rise. Common carp, gudgeon and European perch were chosen as the subjects of the experiments. The authors selected these three common freshwater species for the differences in their hearing abilities. Common carp and gudgeon are known to have much better hearing than European perch. The researchers exposed the three species to recordings of ships on the Danube and two Austrian lakes. They measured the level of cortisol secreted by fish before and after noise exposure.

The results show that under ship noise conditions, cortisol secretions increased from 80% to 120% compared to the no-noise situation, depending on the species. However, under continuous white noise (with no preferred frequency), no significant increase in the stress indicator was observed among the three species. The scientists conclude that exposing fish to ship noise induces a relatively acute stress response independent of the hearing abilities of the fish species. They also argue that the variability of the noise is a more important parameter than the intensity. The authors point out that unusual high levels of cortisol secretion caused by external stress factors such as noise may have detrimental effects on growth, sexual maturation and reproduction in fish.

In Europe, there is growing concern about noise issues. Road traffic, railway and aircraft noise regulations have been implemented to tackle this environmental issue. Man-made sources of noise are well-known to generate sleep disturbances in a significant number of Europeans. As illustrated in this study, not only human beings but also animals are subject to these sources of noise. The results provide new evidence of the need to regulate this form of aquatic pollution quickly, since it is not yet taken into account in European policies.

Source: Lidia Eva Wysocki, John P. Dittami and Friedrich Ladich (2006) "Ship noise and cortisol secretion in European freshwater fishes", *Biological Conservation* 128:501-508.

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