

**APPLICATION OF WAVELET TRANSFORM FOR ANALYSIS SIGNALS EMITTED
BY SPERM WHALES. PRESENTATION OF THE RESULTS OBTAINED
USING DAUBECHIES 15 WAVELET**

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Through this article our aim is to demonstrate the advantages of using the wavelet transform to provide a representation of the intrinsic characteristics of sound emissions from marine mammals and specifically those of the sperm whale. This approach serves as an alternative to more commonly used estimators which are based on the Frontier Transform, an approach which tends to leave too large a margin for discrepancy as the hypotheses necessary for its application are in certain cases, not sufficiently confirmed. A wide range of alternative mathematic estimators can be used to satisfy cetologists priorities. For instance, they would gain from a simple yet thorough representation of the signals they are recording in order to carry out an analysis of identification and recognition of the marine mammals. A variety of signal processing techniques are widely known in time series analysis. In the following article, we will adapt these algorithms so that they can fulfil the same needs as the time series analysis. Secondly, cetologists are currently employing new means in locating and tracking marine mammals. At iSNS (our laboratory), we are working on an approach based on the recordings of marine mammal signals; the results from this data com from the wavelet transform. This article provides the reasons behind this approach. In addition, thanks to the use of new processors, this algorithm once heavy in calculation time can be integrated in a real-time system

EFFECTS OF SHIPPING NOISE ON SPERM WHALE POPULATIONS

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Along with the rather recent interest and findings on the cetacean use of sound as an ad-hoc source of energy in the underwater environment, concerns about the effects of environmental degradation and, particularly, the effects of man-made noise on marine mammal conservation, including acoustic pollution, have been mentioned increasingly often. Some direct effects are already notable, such as the increasing mortality rates from shipping collisions with dolphins and whales. From preliminary data in the region of the Canary Islands where resident cetacean populations, particularly sperm whales, are exposed to heavy maritime traffic it is suspected that the local acoustic budget may be influencing the increasing collision rates. Controlled Exposure Experiments (CEE) were conducted to test the feasibility of using an underwater speaker system to prevent collisions and repel sperm whales from ferry routes. None of the low frequency sounds tested were found to have an effect on the whales behaviour. The analysis of the inner ear structures of two sperm whales killed after a collision with a ferry in the Gran Canaria waters showed that there were no fractures or other overt evidence of impact, or ship strike related injuries; however, ears from both animals had reduced auditory nerve volumes. One animal also had patches of dense tissue in the inner ear. These findings confirmed by the histological analysis are consistent with auditory nerve degeneration and fibrous growth in response to low frequency inner ear damage. Although there is no available data on a direct relationship between long-term low frequency sounds exposure from shipping and the increasing collision rate possibly inducing the decline of the local population of sperm whales, the combined results from the CEE and the inner ear structures analysis suggest that low frequency sounds could be considered a marine hearing hazard.