

ID: W2159106918

TITLE: ?Gas and Fat Embolic Syndrome? Involving a Mass Stranding of Beaked Whales (Family <i>Ziphiidae</i>) Exposed to Anthropogenic Sonar Signals

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ABSTRACT:

A study of the lesions of beaked whales (BW) in a recent mass stranding in the Canary Islands following naval exercises provides a possible explanation of the relationship between anthropogenic, acoustic (sonar) activities and the stranding and death of marine mammals. Fourteen BWs were stranded in the Canary Islands close to the site of an international naval exercise (Neo-Tapon 2002) held on 24 September 2002. Strandings began about 4 hours after the onset of midfrequency sonar activity. Eight Cuvier's BWs (*Ziphius cavirostris*), one Blainville's BW (*Mesoplodon densirostris*), and one Gervais' BW (*Mesoplodon europaeus*) were examined postmortem and studied histopathologically. No inflammatory or neoplastic processes were noted, and no pathogens were identified. Macroscopically, whales had severe, diffuse congestion and hemorrhage, especially around the acoustic jaw fat, ears, brain, and kidneys. Gas bubble-associated lesions and fat embolism were observed in the vessels and parenchyma of vital organs. In vivo bubble formation associated with sonar exposure that may have been exacerbated by modified diving behavior caused nitrogen supersaturation above a threshold value normally tolerated by the tissues (as occurs in decompression sickness). Alternatively, the effect that sonar has on tissues that have been supersaturated with nitrogen gas could be such that it lowers the threshold for the expansion of in vivo bubble precursors (gas nuclei). Exclusively or in combination, these mechanisms may enhance and maintain bubble growth or initiate embolism. Severely injured whales died or became stranded and died due to cardiovascular collapse during beaching. The present study demonstrates a new pathologic entity in cetaceans. The syndrome is apparently induced by exposure to mid-frequency sonar signals and particularly affects deep, long-duration, repetitive-diving species like BWs.

SOURCE: Veterinary pathology

PDF URL: <https://journals.sagepub.com/doi/pdf/10.1354/vp.42-4-446>

CITED BY COUNT: 302

PUBLICATION YEAR: 2005

TYPE: article

CONCEPTS: ['Beaked whale', 'Whale', 'Sonar', 'Extant taxon', 'Decompression sickness', 'Embolism', 'Medicine', 'Anatomy', 'Biology', 'Decompression', 'Fishery', 'Internal medicine', 'Physiology', 'Oceanography', 'Geology', 'Evolutionary biology']