

MARINE MAMMALS and NOISE

THE ISSUE

In recent years, a series of high-profile whale strandings associated with nearby navy sonar use has led to growing public concern about the impacts of human-caused noise on marine mammals, especially the wholly aquatic and acoustically sensitive whales and dolphins. Whales and dolphins (also called *cetaceans*) rely heavily on their sense of hearing to navigate, locate prey, avoid predators, communicate, and otherwise function in the ocean environment. This is because sound travels very well in water, whereas light only penetrates for a short way below the ocean's surface. Clearly the increasing amount of human-caused noise in the ocean may be a growing problem for these sound-sensitive creatures.

Cetaceans can suffer not only hearing damage when exposed to loud noises, but also other physical and physiological harm. For example, exposure to an unexpected and unnatural loud noise could startle a deep-diving whale, causing it to bolt for the surface in a panic – such a rapid ascent could lead to bubbles forming in the tissues (a condition known in human divers as “the bends”) and then to a stranding.

SONARS AND OTHER NOISE SOURCES

Mid-frequency tactical sonars, such as the SQS 53C (“53 Charlie”), have been commonly deployed on U.S. Navy vessels since the 1960s. The relatively new Surveillance Towed Array Sensor System (SURTASS) Low Frequency Active (LFA) sonar is now in limited use – the Navy claims it can detect today's “quieter” submarines more reliably and at a greater distance than is possible with mid-frequency sonars. This is because low frequency sounds travel farther and lessen in volume less rapidly than mid- or high-frequency sounds underwater.

All active sonars emit a noise pulse or “ping” – in the case of LFA sonar, a “ping” is 6 to 100 seconds in duration. These sound pulses bounce off a target (such as a submarine) and return as echoes that are detected by underwater microphones, called hydrophones. The hydrophones are passive – they listen for the echoes or for sounds actively generated by ships, submarines and even whales.

Evidence is mounting that mid-frequency sonars can harm at least certain species of whales – to the point of causing fatal mass strandings – and has probably been doing so for decades (see “Case study” below). While mid-frequency sonar has been clearly linked to evidence of harm, its range of potential impact is smaller than LFA sonar's (although there are many more 53 Charlies deployed throughout the ocean than LFA systems). LFA sonar's relatively limited use has yet to be associated with harm to marine mammals (although research has shown whales may change their behavior when exposed to it), but its greater range and sustained loudness could ultimately affect a far greater number of whales and other marine animals, especially if the number of operational systems increases.

Other human-made noise sources are also loud and, though their sound characteristics differ from sonar's, could be harmful in different ways. For example, shipping noise (from the vast fleet of trans-oceanic container ships, tankers, and other large vessels) is low frequency and pervasive in many parts of the ocean. While it is unlikely to cause acute physical harm

(although repeated close exposures could cause long-term hearing loss), it may “mask” important communication signals from baleen whales, whose vocalizations are in the low frequency range.

Seismic airguns, used by the petroleum industry to detect pockets of oil or natural gas within the ocean floor and by researchers to locate sub-surface geological features, sound like underwater gun blasts and at times can be heard throughout entire ocean basins. Such impulsive sounds can be acutely harmful to nearby animals, but may also disturb (repeatedly startle) marine mammals to the point where they abandon important habitat. Other human-made noise sources with the potential to harm marine mammals include demolition and military explosives and “seal scarers” (also known as acoustic harassment or deterrence devices).

CASE STUDY: MID-FREQUENCY SONAR

In March 2000, a mass stranding of beaked whales, minke whales, and one dolphin occurred off the Bahamas after a U.S. Navy exercise in which mid-frequency active sonars, including 53 Charlie, were used. Coincidentally, qualified marine scientists were on hand to collect the appropriate samples from fresh carcasses to determine cause of death.

The results of the federal investigation into this incident indicate that these whales died from the impacts of exposure to loud sound. Several of the whales were bleeding from the eyes and exhibited other signs of acoustic trauma that caused them to strand and die. The Navy has admitted that its mid-frequency sonars were the only possible source of such noise at the time of the stranding.

Additional strandings of beaked whales and other species in the Canary Islands, Madeira, Puerto Rico, Taiwan, and Hawaii, among other locations, have occurred subsequently in close proximity to navy exercises (of U.S. and other nations) using mid-frequency sonars. In several cases where the carcasses were thoroughly examined, the animals showed signs of acoustic trauma.

Since the 1960s (when use of mid-frequency tactical sonars became widespread), strandings associated with military activity have occurred relatively frequently. However, they were not carefully investigated and the world’s navies denied any connection between sonar use and whale deaths. Indeed, the U.S. Navy continues to maintain that its sonars, particularly LFA sonar, are safe for all marine mammals. In the face of these disturbing incidents, however, this position is insupportable.

The scientific and environmental communities agree that the evidence implicating mid-frequency active sonar as a cause of whale strandings is now overwhelming. These incidents also raise additional questions about active sonar impacts beyond observed injuries and deaths, including interference in communication and stress.

CONCLUSION

Marine noise is one of many environmental threats facing marine mammals, but its impacts are harder to identify than those from chemical pollution or fishing gear entanglement. Noise

impacts may also result in fewer outright deaths (although the science on this is still not clear), but may be more insidious – many noise impacts (such as stress) may be sub-lethal yet significant, reducing reproductive success or shortening life spans. Therefore it is vital that management and mitigation of this threat be pro-active and precautionary. Research is urgently needed to clarify the ways in which human-caused noise can affect marine mammals, but until the science catches up, laws and regulations should be enacted that give the benefit of the doubt to the animals and slow the spread of human-caused noise in the oceans.

For more information, contact your local animal welfare organization or marine life protection and preservation society.