

Whales feel the (sun)burn

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Photo: Fred Benko - National Oceanic and Atmospheric Administration (NOAA) Central Library. Credit: Wikimedia Commons

Whales have been shown to increase the pigment in their skin in response to sunshine, just as we get a tan.

Research published today in Nature journal, *Scientific Reports*, reveals that not only do some species of [whales](#) get darker with sun exposure, incurring DNA damage in their [skin](#) just like us, they also accumulate damage to the cells in the skin as they get older.

Experts in the response of skin to UV radiation at Newcastle University, UK were called in after marine biologists in Mexico noticed an increasing number of whales in the area had blistered skin. Analysing samples from three types of whales – blue, sperm and fin - they worked together to study the changes in the whale skin after their annual

migration to sunnier climes.

Mark Birch-Machin, Professor of Molecular Dermatology at Newcastle University and joint senior author of the paper said: "Whales can be thought of as the UV barometers of the sea. It's important that we study them as they are some of the longest living [sea creatures](#) and are sensitive to changes in their environment so they reflect the health of the ocean."

Migrating whales 'tan'

Over three years, the team of [marine biologists](#) from Trent University, Canada and Universities in La Paz and Querétaro, Mexico, took skin samples from the backs of three species of whales during their annual migration. Occurring between February and April the whales move to the sunnier Gulf of California, along the northwest coast of Mexico.

Blue whales, the jumbo-jet sized giants, have a very pale pigmentation. During migration time the team found a [seasonal change](#) with the pigment in their skin increasing as well as mitochondrial DNA damage. This internal damage to the mitochondria, the engines of the cells, is caused by UV exposure and is what we find in sunburned human skin.

Sperm whales with their distinctive rounded foreheads have a darker pigmentation, also migrate between February and April to the Gulf of California, but have a different lifestyle. They spend long periods at the surface between feeds and are therefore, exposed to more sun and UV.

The scientists found the [sperm whales](#) had a different mechanism for protecting themselves from the sun, triggering a stress response in their genes. Newcastle University researcher Amy Bowman added: "We saw for the first time evidence of genotoxic pathways being activated in the cells of the whales – this is similar to the damage response caused by

free radicals in human skin which is our protective mechanism against sun damage."

In contrast, the darkest whales, the deeply pigmented fin whales, were found to be resistant to sun damage showing the lowest prevalence of sunburn lesions in their skin.

Karina Acevedo-Whitehouse, currently Senior Lecturer at the Universidad Autónoma de Querétaro, Mexico and joint senior author of the paper said: "There has been an increase in the number of reports on blister-type skin lesions in various whale species in areas of high UV radiation. In many cases no infectious microorganism has been found associated with these lesions. It's important that we study the effect of UV radiation on whale skin and the mechanisms that these species use to counteract such damage, both from an evolutionary approach and from a conservation perspective."

To carry out the research the Newcastle University team had to develop an analysis which allowed three whale genomes to be analysed at the same time, a difficult task as whales have very different sequences. This research is the first time that whales have been studied at a genetic level linking to migratory patterns and genetic damage.

"We need to investigate further what is happening," said Professor Birch-Machin, "if we are already seeing blistered skin in the whales caused by UV damage then we want to know whether this could develop into skin cancer and therefore serve as an early warning system.

"These whales occupy the same area year after year, so it is increasingly possible to understand the status of their populations, and what may be going on around them and in the environment. They are a reminder that changing climatic conditions are affecting every creature on the planet."

More information: Whales Use Distinct Strategies to Counteract Solar Ultraviolet Radiation, Laura M. Martinez-Levasseur, Mark A. Birch-Machin, Amy Bowman, Diane Gendron, Elizabeth Weatherhead, Robert J. Knell, Karina Acevedo-Whitehouse. Nature publishing group journal, *Scientific Reports*.

Provided by Newcastle University

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