

Study details toxic elements found in stranded whales, dolphins over 15 years

February 21 2024



Annie Page, DVM, Ph.D., (pictured in the center) and her team prior to a necropsy of a stranded whale. Stranding response conducted under a stranding agreement between NOAA Fisheries Service and FAU Harbor Branch Oceanographic Institute under the authority of the MMPA. Credit: Annie Page/FAU Harbor Branch

Whales and dolphins get their nutrients and essential elements through their diet. While eating fish, squid, octopus, crustaceans, and other marine mammals, they are also exposed to heavy metal contaminants.

Elevated levels of toxins have been found in stranded dolphins and [whales](#) along the Southeastern Coast of the United States. Monitoring toxic contaminants in these stranded marine animals, which serve as important sentinels of environmental contamination, and whose health may be linked to human health, is vital.

Yet, data remain sparse on how specific elements are distributed within an animal's body, especially for many rarely encountered species, and how toxicant levels relate to its sex, breed, age, and other demographic factors.

A study led by Florida Atlantic University's Harbor Branch Oceanographic Institute in collaboration with a team of scientists evaluated the prevalence, concentration, and tissue distribution of essential and non-essential trace elements, including heavy metal toxicants in tissue (blubber, kidney, liver, [skeletal muscle](#), skin) and [fecal samples](#) collected from 90 whales and dolphins stranded in Georgia and Florida from 2007 to 2021.

Researchers analyzed 319 samples from nine species for concentrations of seven essential (cobalt, copper, iron, manganese, molybdenum, selenium, zinc) and five non-essential (arsenic, cadmium, lead, mercury, thallium) elemental analytes. Species in the study all occupied high and similar trophic levels and consumed a mixture of cephalopods and fishes.

Results of the study, [published](#) in the journal *Heliyon*, showed that Risso's dolphins (*Grampus griseus*) and short-finned pilot whales (*Globicephala macrorhynchus*) had the highest median concentrations of

mercury, cadmium and lead, while dwarf sperm whales (*Kogia sima*) had the lowest.



Stranding response conducted under a stranding agreement between NOAA Fisheries Service and FAU Harbor Branch Oceanographic Institute under the authority of the MMPA. Credit: Annie Page/FAU Harbor Branch

Adult pygmy and dwarf sperm whales that stranded from 2019 to 2021 had higher concentrations of arsenic, copper, iron, lead, manganese, selenium, thallium, and zinc compared to those that stranded from 2010 to 2018, suggesting an increasing risk of exposure over time.

"When we separated phylogenetic groups into age classes and compared

median concentrations of heavy metals in specific tissue types between adult specimens of species, we found some interesting trends," said Annie Page, D.V.M., Ph.D., senior author, an associate research professor and clinical veterinarian, FAU Harbor Branch.

The highest concentrations of many elements (e.g., cadmium, cobalt, copper, manganese, molybdenum, thallium, zinc) were in fecal samples, illustrating the usefulness of this non-invasively collected sample.

Aside from fecal samples, hepatic or liver tissues had the highest concentrations of iron, manganese, mercury, molybdenum, and selenium in most species; renal or kidney tissues had the highest concentrations of cadmium; the skin had the highest concentrations of zinc; and copper, arsenic and lead concentrations were primarily distributed among the liver and kidneys.

The lowest median concentrations of mercury and cadmium were in liver, kidney, blubber, and muscle samples, with the lowest skin mercury concentration and the lowest liver lead concentration all from dwarf sperm whales.

Mercury is one of the most toxic elements in marine systems and can bioaccumulate and biomagnify through marine food webs. Cetaceans are exposed to mercury and other toxic metals mostly by consuming contaminated prey items, which tend to accumulate mercury in the liver, muscle, and other tissues over time.



Credit: Annie Page/FAU Harbor Branch

"Exposure to heavy metal contaminants can result in oxidative stress, which can impair protein function, damage DNA, and disrupt membrane lipids," said Page. "Heavy metal exposure has been linked to degenerative heart disease, immunodeficiency, and increased parasite infestations, among other disease risks."

Findings from the study provide important baseline data needed to assess further the pathophysiological mechanisms and ecotoxicological hazards associated with exposure to and accumulation of trace elements in tissues of free-ranging whales and dolphins.

"Because tissue concentrations of heavy metal contaminants also vary

based on an individual animal's sex, age class, trophic level, and location, among other factors, it is important to first establish baseline values and then continue to monitor cetacean populations for exposure to these toxicants," said Page.

Species examined in the study were pygmy sperm whales (*Kogia breviceps*); dwarf sperm whales; Gervais' beaked whales (*Mesoplodon europaeus*); Risso's dolphins; short-finned pilot whales; sperm whales (*Physeter macrocephalus*); melon-headed whales (*Peponocephala electra*); a Blainville's beaked whale (*Mesoplodon densirostris*); and a false killer whale (*Pseudorca crassidens*).

More information: Annie Page et al, Trace element bioaccumulation, tissue distribution, and elimination in odontocetes stranded in Florida and Georgia, USA over a 15-year period (2007–2021), *Heliyon* (2024). DOI: [10.1016/j.heliyon.2024.e25552](https://doi.org/10.1016/j.heliyon.2024.e25552)

Provided by Florida Atlantic University

Citation: Study details toxic elements found in stranded whales, dolphins over 15 years (2024, February 21) retrieved 28 April 2024 from <https://phys.org/news/2024-02-toxic-elements-stranded-whales-dolphins.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.