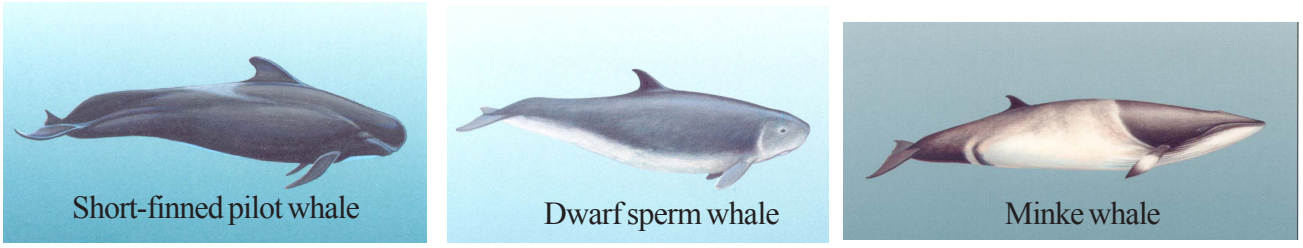
# MULTI-SPECIES UNUSUAL MORTALITY EVENT IN NORTH CAROLINA FACT SHEET

## Multi-species Unusual Mortality Event (UME)

On January 15, 2005, a National Park Service Ranger reported a mass stranding of approximately 33 short-finned pilot whales (*Globicephela macrorhynchus*) at Cape Hatteras National Seashore. The NOAA Fisheries Service Beaufort Laboratory led the response of multiple partners from the Southeast Region Marine Mammal Stranding Network. Weather conditions and logistics as this remote site were extremely challenging for responders. A minke whale (*Balaenoptera acutorostrata*) was also reported the same morning near Corolla, North Carolina. It stranded alive and due to its poor condition, was euthanized. On January 16, 2005, two live dwarf sperm whales (*Kogia simus*) were also reported stranded near Cape Hatteras and died just prior to responders arriving on-site. There were a total of 36 marine mammals involved in this UME.



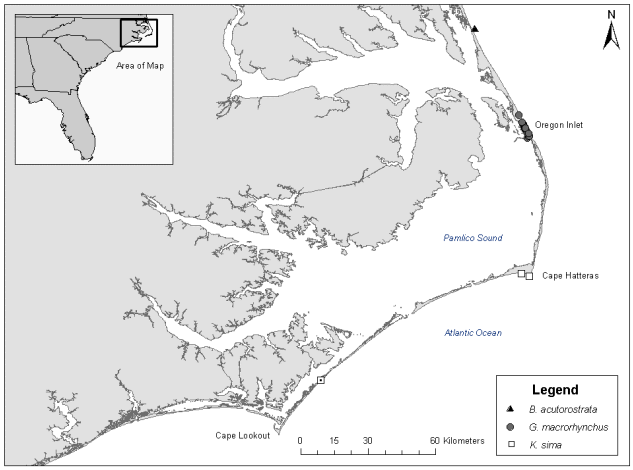

*Illustrations from: Wynne, Kate and Malia Schwartz. 1999. Guide to Marine Mammals and Turtles of the U.S. Atlantic and Gulf of Mexico. Rhode Island Sea Grant, University of Rhode Island and NOAA Sea Grant. 114 pp. Illustrations by Garth Mix.*

## What is known about historic stranding events in North Carolina?

Since 1992, 31 species of whales and dolphins are known to have stranded along the North Carolina coasts. All three species of whales and dolphins involved in this event are known to occasionally strand in this area.

## What was the geographic scope of the Multi-species Unusual Mortality Event?

The stranding events were distributed between northern North Carolina to Cape Hatteras, North Carolina, over a 111 km area (straight line following the beach).



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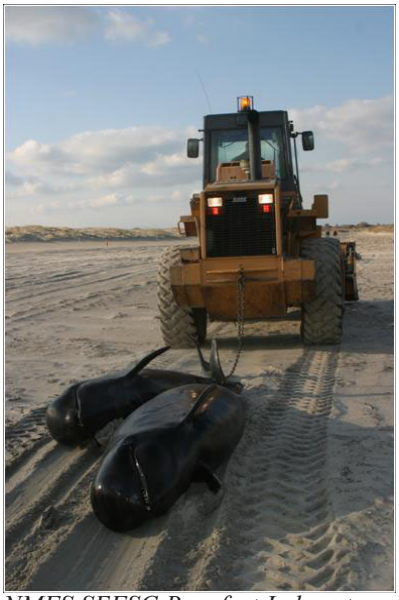
## Why were these stranding events declared an Unusual Mortality Event (UME)?

There are seven criteria used by the Working Group on Marine Mammal Unusual Mortality Events to determine when an event is a UME. Only one of the seven criteria needs to be met for declaring a UME. The North Carolina event met three of those seven criteria: (1) Three species stranded within 24 hours, including both live and dead animals, (2) there was an increase in stranding events, occurring in a very localized area, and (3) the multi-species composition was different than that of animals normally stranding in the area.

## How did NOAA Fisheries Service conduct the UME investigation?

As with all stranding events, NOAA Fisheries Service and our partners systematically collect as much information and as many samples as possible from each of the whales for a variety of analyses. For example, a team of scientists from NOAA Fisheries Service and multiple universities evaluated each organ system of the whales and tested for infectious diseases in many of the whales. Twenty-five pilot whale heads were examined at nine anatomic locations of interest. CT scans were done on two pilot whales and two adult dwarf sperm whales; the results of which are still pending. Toxin and organic chemical analyses are also still pending. A complete suite of analyses was not done on all animals due to decomposition but the samples from fresher animals yielded much more information from more complete sampling. As part of the scientific process, NOAA Fisheries Service also requested reviews of the actual pathology slides from five veterinary pathologists from the United States, Britain, Canada, and Spain, and a dozen experts from the United States, Britain, and Spain reviewed the written results.



*NMFS SEFSC Beaufort Laboratory*

## What were the necropsy results?

Many of the whales died from the stranding event itself and showed physiological deterioration from being on land for an extended time period, resulting in dehydration, electrolyte imbalances, and damage to muscles and organs. A few of the whales had on-going chronic medical problems such as cardiac and musculoskeletal disease.

There were also a variety of lesions in all organs with the majority being incidental, and not likely to cause death or debilitation of any of the animals. There was consensus among experts that the lesions found in these whales were not consistent with acoustic-related trauma or air-bubbles in tissues reported in recent publications from Britain or the Canary Islands.

One pilot whale had acute hemorrhage in several areas of the meninges surrounding the brain that occurred within hours of the whale's death. There were no hemorrhages within the brain tissue. Although it's occurrence prior to stranding cannot be completely ruled out, it is likely this hemorrhaging was caused from thrashing during the stranding event.

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## What caused the stranding of these whales?

While we may never know the cause of these stranding events, certain causes were ruled out: (1) there was no evidence of systemic infectious disease (e.g., viral, fungal, protozoal or widespread bacterial) except a few individual animals with intra-abdominal infections; (2) parasite loads were not unusual; and (3) there was no common link among all animals.

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***Pilot whales***

- In general, pilot whales are a species commonly involved in mass stranding events.
- Many of the pilot whales died from the stranding event itself- due to deterioration for being on land for an extended period.
- Four of the whales (3 pilot whales and 1 dwarf sperm whale) had chronic, ongoing disease prior to the stranding.
- Environmental conditions, changes in wind direction and speed, changes in upwelling conditions, bathymetry, may have contributed to the stranding by causing the animals to become too close and move to shore.

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***Minke whale***

- Very young animal with overall poor body condition and poor immune system.

***Dwarf sperm whales***

- One dwarf sperm whale was found with chronic cardiovascular disease while for the other no chronic or acute disease was found.

## What do scientists look for when investigating acoustic trauma in marine mammals?

Scientists examine the demographics and circumstances surrounding the strandings and do complete examinations of as many animals as possible to evaluate cause and manner of death for the whole group. Based on the findings in recent investigations, they look for hemorrhages in tissues with particular emphasis on acoustic tissues and the brain (e.g., ears, acoustic fats in the jaw and around the ears, sinuses, and brain). Lipid or gas emboli (fat or air bubbles in tissues or vessels) in various body organs or vessels have been found in animals from mass strandings associated with sonar activities, therefore scientists also closely examine carcasses for evidence of fat or gas emboli. The actual mechanism of these gas or fat emboli are not known.

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## What role did sonar play in these stranding events?

- The ability to answer this question for any stranding event is highly constrained by the overwhelming lack of knowledge about how marine mammal tissues and behavior may be affected by sound exposure (either natural or anthropogenic). While previous evidence supports the conclusion that mid-frequency tactical sonar may play a role in marine mammal stranding events under certain conditions, we were not able to connect this stranding event to the use of sonar.

- Over a three-day period (12-14 Jan 2005) just prior to the onset of this stranding event (15 Jan), military, tactical mid-frequency sonar operations were conducted by individual U.S. Navy surface vessels over short durations (minutes) and small spatial scales. These kinds of transmissions are neither unusual for the area in which they were conducted nor for time of year. The operational area lacks certain environmental features (*e.g.*, constricted channels) known to exist in many or most previous sonar-related events.

- Sound propagation modeling was conducted to estimate exposure fields around the five known transmissions during 12-14 Jan. However, due to the absence of information regarding the location of animals during sonar transmissions, it is not possible to estimate with any certainty the magnitude of acoustic exposure (if any).

- The lesions observed in these whales were not consistent from animal to animal nor between the species. In addition, the observed lesions were not consistent with the decompression like lesions reported in deep diving whales (e.g., beaked whales) in previous sonar-related mass strandings, e.g., no gas or fat emboli, only one animal with moderate meningeal hemorrhage, and few animals with acoustic fat hemorrhage.

- The known active sonar transmissions of individual surface vessels were spatially and temporally associated with UMESE0501Sp and, while the evidence is not particularly compelling in this regard, may not be ruled out as a potential causative factor

## How does sonar impact marine mammals?

The potential effects of sonar on marine mammals remain an area of scientific uncertainty. Laboratory information regarding hearing and the effects of noise provide quantitative means of estimating the ranges at which sonar and other human sound sources may be detectable to marine mammals and may affect them. These data indicate that many active sonar systems are audible to many marine animals over considerable distances in many cases and that, if sufficiently intense or sustained, may affect hearing or other systems. However, behavioral and physiological responses of marine mammals to sound sources are highly context-specific and poorly understood. Our understanding of the type and magnitude of behavioral and physiological responses to active sonar, and the extent to which these responses may contribute to marine mammal stranding events, remains rudimentary.