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Does a lack of beaked whale strandings in relation to military exercises mean no impacts have occurred? A comparison of stranding and detection probabilities in the Canary and Hawaiian Islands

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A number of recent cetacean strandings have been linked to naval exercises, particularly involving mid-frequency sonar. Two species most affected are Cuvier's and Blainville's beaked whales. In 22 years there have been six such strandings in the Canary Islands, yet none have occurred in the Hawaiian Islands, despite the existence of regular naval exercises in the islands and resident populations of both species of beaked whales. Assessments of potential impacts of ongoing naval exercises in Hawai'i have used the lack of mass strandings to imply that there have been no past impacts. We hypothesize that the likelihood of a dead or moribund beaked whale stranding, and the probability of a stranded animal being detected, differ between the Canary and Hawaiian Islands. We examine near-shore bathymetry, shoreline slope, human population densities, fringing reef presence, ocean currents, sea surface temperature, and the presence of large scavenging sharks. The Canary Islands have a greater proportion of beaked whale "habitat" (depths >650 m) closer to shore (10.6% versus 6.3% within 3-km of shore), with a steeper slope (avg. slope Canaries -134m/km, Hawai'i -95 m/km). Hawai'i is dominated by steeper (>50°) shoreline cliffs (6% of shorelines vs. <1% for Canaries), human population density is 28% of that in the Canaries, and population per kilometer of shoreline is 53% of that in the Canaries. Fringing reefs are common around the main Hawaiian Islands, while such reefs do not form in the Canaries. Suitable habitat closer to shore, more accessible coastlines, lack of fringing reefs, lower water temperature with slower currents, and increased human population densities all suggest moribund or dead beaked whales are more likely to strand and be detected in the Canary Islands. We conclude that a lack of mass strandings in the Hawaiian Islands cannot be used to indicate a lack of impact.

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