SHORT-FINNED PILOT WHALE DIVING BEHAVIOR: DEEP FEEDERS AND DAY-TIME SOCIALITES

Robin W. Baird[1], Daniel J. McSweeney[2], Michael R. Heithaus[3] and Gregory J. Marshall[3]

[1]NOAA Fisheries, Beaufort, NC, USA and Dalhousie University, Halifax, NS, Canada
[2]Wild Whale Research Foundation, Holualoa, HI, USA
[3]National Geographic Television, Washington, DC, USA

Pilot whales have long been thought to be deep divers, yet until recently no information has been available on diving depths of either species. Limited information on long-finned pilot whales in the Ligurian Sea suggest they remain relatively inactive during the day, dive deeply at dusk following vertically migrating prey, and feed near the surface at night (Baird et al. 2002). In Hawai'i, short-finned pilot whales are found year-round associated with island slopes, typically in waters ranging from 1,000-2,000m. We tested the hypothesis that this species dives deeply at dusk and dawn, presumably to follow vertically migrating prey, and forages near the surface at night. In 2002 we deployed 10 time-depth recorders (TDRs – 9 recovered) and 6 Crittercams (video systems), collecting 101h of TDR data and ~10h of video footage. The deepest dives recorded (typically 600-800m, max. 27min.) were during the day. Such deep dives were recorded for all five individuals where TDRs remained attached >8h. At night, these five whales dove regularly to between 300-500m, and the rate of deep (>100m) dives at night (mean=2.77/h, SD=0.51) was 3.6 times higher than during the day (mean=0.77/h, SD=0.16). Shallow (<100m) diving or surface resting occupied an average of 82.8% of day-time periods (SD=18.6), but only 21% (SD=21.0) of night-time periods. Video footage during day-time shallow dive periods indicated that the whales were engaged in social, rest and travel behaviors, but no feeding was documented. Overall our hypothesis of a crepuscular diving pattern and near-surface feeding at night was not supported. However, diel diving patterns presumably reflect searching for vertically migrating prey, though the prey were concentrated at depths of 300-500m at night. Differences in diving patterns from long-finned pilot whales likely reflect differences in the vertical migration of prey, and emphasize that cetacean diving activities are primarily driven by prey behavior.

Abstract submitted to the 15th Biennial Conference on the Biology of Marine Mammals, Greensboro, NC, December 2003

HAWAIIAN ISLAND POPULATIONS OF FALSE KILLER WHALES AND SHORT-FINNED PILOT WHALES REVEALED BY GENETIC ANALYSIS

Susan J. Chivers[1], Richard G. LeDuc[1], and Robin W. Baird[2]

[1]NMFS-Southwest Fisheries Science Center, 8604 La Jolla Shores Dr., La Jolla, CA 92037
[2]NMFS-Southeast Fisheries Science Center, 101 Pivers Island Road, Beaufort NC 28516

Although there are no obvious barriers to movement across the Pacific, we found evidence of population structure for false killer whales (*Pseudorca crassidens*) and short-finned pilot whales (*Globicephala macrorhynchus*) inhabiting the eastern and central North Pacific. We sequenced 957 base pairs of the mitochondrial DNA control region for 63 *P. crassidens* and 157 *G. macrorhynchus*. Nearly all samples were collected from animals biopsied at sea in the eastern North Pacific (n = 37 *P. crassidens*; n = 99 *G. macrorhynchus*) and around Hawaii (n = 19 *P. crassidens*; n = 50 *G. macrorhynchus*). The remaining samples were collected in the western Pacific, Indian and western North Atlantic Oceans, and the resulting sequences provided additional information about intra-specific genetic diversity. Nucleotide diversity was fairly low for *P. crassidens* (0.41%) and *G. macrorhynchus* (0.28%) compared to other delphinids (*i.e*., 1-2%), and only 17 haplotypes were identified for *P. crassidens* and 14 for *G. macrorhynchus*. Phylogentic analyses revealed divergent haplotypes unique to animals sampled off Hawaii in both species suggesting long-term reproductive isolation of those populations. Additional evidence of population structure was found in *G. macrorhynchus* sampled off Clipperton Island and the Galapagos Islands in the eastern tropical Pacific. Each island group had haplotypes not found elsewhere. Although our data provide evidence for population structure within the eastern North Pacific Ocean (*P. crassidens* $\Phi_{st} = 0.68$; *G. macrorhynchus* $\Phi_{st} = 0.90$) when tested against a null hypothesis of panmixia, geographic boundaries for the populations cannot yet be identified. However, because both of these species have been observed taken in the pelagic longline fishery, we suggest that the Hawaiian exclusive economic zone (EEZ) continue to be recognized as a management unit and consideration be given to managing the animals impacted by the pelagic longline fishery outside the Hawaiian EEZ separately.

Abstract submitted to the 15th Biennial Conference on the Biology of Marine Mammals, Greensboro, NC, December 2003

ONLY 50 KMs APART, YET BOTTLENOSE DOLPHINS DO NOT MOVE BETWEEN ISLANDS IN THE MAIN HAWAIIAN ISLAND CHAIN

Antoinette M Gorgone[1], Robin W. Baird[1,2], and Daniel L. Webster[3]

[1]NOAA Fisheries, 101 Pivers Island Road, Beaufort, NC 28516 USA
[2]Biology Department, Dalhousie University, Halifax, Nova Scotia, B3H 4J1 Canada
[3]Hawaii Wildlife Fund, Volcano, HI USA

Given their long-distance movements elsewhere, it seemed likely that bottlenose dolphins around the main Hawaiian islands would move between islands, since they are only separated by ~50 km. To test the hypothesis that dolphins around different islands mix freely, we compared photographs of bottlenose dolphins from three areas in the main Hawaiian Island chain (O'ahu, Maui/Lana'i, and Hawai'i). Field work was undertaken off Maui/Lana'i from February 2000-March 2001 (68 individuals documented), and off all three areas in April/May 2002 (58 individuals documented), and May 2003 (69 individuals documented). A total of 170 distinctive individuals were documented, some seen on multiple occasions within or between years. Off Maui/Lana'i, we identified 18 individuals in 2002 and 16 individuals in 2003, and 11 and 13 of these, respectively, had been documented there in a previous year, indicating that individuals are likely resident to the area. Of the individuals identified off O'ahu (29 in 2002, 50 in 2003) and Hawai'i (11 in 2002, 2 in 2003), none have been documented off Maui/Lana'i. Only one between-year resighting was found off O'ahu, suggesting either a low degree of site fidelity or a much larger population size off that island. A lower degree of site fidelity may be related to the size of the habitat, since the Maui/Lana'i area has ~3,800km^2 of the shallow-water (<200m) habitat apparently preferred by bottlenose dolphins, while O'ahu and Hawai'i each have ~1,000km^2 of shallow-water habitat. Given a ~70% between-year resighting rate off Maui/Lana'i, we would have expected ~64 of 92 individuals from O'ahu and Hawai'i to have been previously documented if the dolphins were moving freely between islands. These data suggest that movements between these islands are extremely limited, if not absent. Skin biopsies collected (65 to date) will be used to test for genetic differentiation among populations around different islands.

Abstract submitted to the 15th Biennial Conference on the Biology of Marine Mammals, Greensboro, NC, December 2003

INTER-ISLAND DIFFERENCES IN CETACEAN SPECIES COMPOSITION IN THE MAIN HAWAIIAN ISLANDS

Daniel J. McSweeney[1], Robin W. Baird[2,3], Daniel L. Webster[4], Allan D. Ligon[4], Alice I. Mackay[5], La'Ren K. Antoine[1], and Antoinette M. Gorgone[2]

[1]Wild Whale Research Foundation, Holualoa, HI USA
[2]NOAA Fisheries, Beaufort, NC, USA
[3]Dalhousie University, Halifax, NS, Canada
[4]Hawaii Wildlife Fund, Volcano, HI, USA
[5]Sea Mammal Research Unit, University of St. Andrews, St. Andrews, Fife, Scotland

The main Hawaiian islands comprise eight volcanic pinnacles rising from the ocean floor to elevations of up to 4,000m. The "4-island area" (Maui, Lana'i, Moloka'i, Kaho'olawe) has a broad plateau with >3,800km^2 of shallow water (<200m deep) habitat, but the four other main islands all have relatively little shallow water habitat (<~1,000km^2 each), dropping quickly to 500-2,000m deep. Surveys in 2000-2002 off the three eastern-most areas (the 4-islands, O'ahu, and Hawai'i) demonstrated similar cetacean species composition among islands. However, no extensive boat-based efforts had examined odontocetes in the western islands (Kaua'i/Ni'ihau) prior to this study. During May/June 2003 we spent ~520 hours surveying ~8,500km of trackline around all these islands, in depths from 20-3,000m. Approximately 1,700km were covered off each of Hawai'i, the 4-island area, and O'ahu, with 3,200km off Kaua'i/Ni'ihau. We observed 14 odontocete species (140 groups - 137 identified to species/genus). The five most frequently observed (bottlenose, pantropical spotted, spinner and rough-toothed dolphins, and short-finned pilot whales) accounted for ~84% of sightings. For these five, a variety of differences in species densities (measured as # groups/100km) between islands were documented. Spotted dolphins and short-finned pilot whales were regularly observed off all three eastern-most study areas (0.40 and 0.29 groups/100km, respectively), but were uncommon off Kaua'i/Ni'ihau (0.12 and 0.06 groups/100km, respectively). Rough-toothed dolphins were found frequently off Kaua'i/Ni'ihau (0.34 groups/100km), but were rare elsewhere (0.04 groups/100km). Bottlenose dolphins were abundant off Kaua'i/Ni'ihau, O'ahu, and Maui/Lana'i (0.56 groups/100km), but were rare off Hawai'i (0.06 groups/100km). Only spinner dolphin densities were relatively similar (range 0.12-0.28 groups/100km) among islands. Differences in species composition likely reflect differences in prey availability. It is also possible that shooting of rough-toothed and bottlenose dolphins off the island of Hawai'i, due to their tendency to steal fish from fishermen, has resulted in population reductions in that area.

Abstract submitted to the 15th Biennial Conference on the Biology of Marine Mammals, Greensboro, NC, December 2003