Oceanographic Measurements of a Marine Heatwave and the Behavioral Response of a Top Predator: The Northeast Pacific Blob 2014-2017

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All organisms face resource limitations that will ultimately restrict population growth, but the controlling mechanisms vary across ecosystems, taxa, and reproductive strategies. As climate change continues to alter ecosystem processes across the globe, organisms are confronted with new challenges to their ability to survive. The Northeast Pacific Blob was a multi-year marine heatwave that affected ecosystems across the Northeast Pacific, from producers to top predators. We quantified the subsurface extent and evolution of the Blob using oceanographic instruments carried by northern elephant seals (*Mirounga angustirostris*), a top predator that forages on the abundant biomass of the mesopelagic Northeast Pacific Ocean. We then assessed the effect of this marine heatwave on the foraging behavior of adult female northern elephant seals. We used a combination of telemetry data collected by instrumented seals (temperature, salinity, location, depth) along with body composition and energy gain metrics to examine the population-level effects of the Blob. We found significant warm anomalies throughout the top 1000m of the water column during the Blob, and that northward advection of warm, salty water at the base of the pycnocline likely played an important role in the sustained accumulation of warm water. Comparing foraging behavior during 2014 and 2015 to our 15-year tracking time series, we found evidence of a plastic behavioral response. Females increased their use of the Alaska Gyre, increased their daytime foraging effort, and increase their use of deep water (>800m depth) during the summer months, suggesting that the prey field changed relative to previous years. Northern elephant seals are both generalist predators and capital breeders, which may buffer the effect of acute events, allowing them to adjust to environmental variability more than highly specialized or constrained predator species. Biologging technology not only increases our understanding of animal behavior, but also gives us unprecedented insight into the changing environment these animals are experiencing.