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Blue Whale Body Condition from Photographs Taken over a 14-Year Period in the North East Pacific: Annual Variations and Connection to Measures of Ocean Productivity

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Abstract : Large marine mammals can serve as an indicator of the overall state of the environment due to their long lifespan and apex position in marine food webs. Reductions in prey, driven by changes in environmental conditions can have resounding impacts on the trophic system as a whole; this can manifest in reduced fat stores that are visible on large whales. Poor health can lead to reduced survivorship and fitness, both of which can be detrimental to a recovering population. A non-invasive technique was used for monitoring blue whale health and for seeing if it changes with ocean conditions. Digital photographs of blue whales taken in the NE Pacific by Cascadia Research and collaborators from 2005-2018 (n=3,545) were scored for overall body condition based on visible vertebrae and body shape on a scale of 0-3 where a score of 0 indicated best body condition and a score of 3 indicated poorest. The data was analyzed to determine if there were patterns in the health of whales across years and whether overall poor health was related to oceanographic conditions and predictors of prey abundance on the California coast. The year was a highly significant factor in body condition (Chi-Square, $p<0.001$). The proportion of whales showing poor body condition (scores 2 & 3) overall was 33% but by year varied widely from a low of 18% (2008) to a high of 55% (2015). The only two years where >50% of animals had poor body condition were 2015 and 2017 (no other year was above 45%). The 2015 maximum proportion of whales in poor body condition coincide with the marine heat wave that affected the NE Pacific 2014-16 and impacted other whale populations. This indicates that the scoring method was an effective way to evaluate blue whale health and how they respond to a changing ocean.

Keywords : blue whale, body condition, environmental variability, photo-identification
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