Functional Ecology

BRITISH ECOLOGICAL SOCIETY

Fin whales consumption rates are four times greater when they feed on deep, dense krill patches

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Large predators require vast amounts of prey to satisfy their energetic demands. Especially in aquatic systems, prey is patchy and can be found throughout the water column. For air-breathing aquatic predators, not only do they have to find enough food to grow, but they also face the challenge of having to return to the surface to replace oxygen stores. The extreme effort required to lunge feed (each lunge is a rapid acceleration with mouth agape into a dense prey patch) limits how long baleen whales can dive on single breath, yet they must find dense enough prey to satisfy their energetic demands. We deployed motion sensing tags on fin whales around the world, and collected concurrent measurements of prey for a subset of these, and found that fin whales increased their feeding rates (lunges/hour) on deeper dives, as generally predicted by optimal foraging theory. With additional information on prey, we show that whales increased their dive depths in order to forage on the densest prey patches. Despite the increased travel time needed to find deeper prey during a breath-hold dive, feeding rates and estimated prey consumption quadrupled compared to shallow foraging. Because the cost of transport is low at this extreme in body size, we posit that feeding on deep prey patches significantly increases the energetic efficiency of foraging. Given the increasing recognition that anthropogenic disturbance can disrupt deep foraging dives in many cetacean species, endangered fin whales may be susceptible to significant energetic losses that may impact individual fitness and population health in some areas.