

# **In-situ measurement of dissolved oxygen concentration and feeding behavior of northern elephant seals in the mesopelagic zone.**

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The ocean's mesopelagic zone (200-1000 m) holds large fish biomass and is a critical foraging habitat for deep-diving marine mammals. The mesopelagic zone is characterized by decreasing dissolved oxygen (DO) concentration with depth, and the oxygen limited zone (OLZ; 0.7-2.0 mg/L) and oxygen minimum zone (OMZ; <0.7mg/L) often occur at a depth range of 600-1000 m. Northern elephant seals (*Mirounga angustirostris*) feed on mesopelagic prey while migrating across the northeast Pacific Ocean, where the spatial variability in midwater DO levels is high. Hypoxic depth zones such as OLZ and OMZ are hypothesized to affect the foraging behavior of northern elephant seals through changes in the depth distribution and composition of mesopelagic prey communities. Here, we report on the feeding behavior of post-breeding female northern elephant seals (n = 9) in relation to in-situ measurements of midwater DO levels, by using newly developed animal-borne DO loggers together with mandible accelerometers and satellite transmitters. Our results showed that all seals had diel patterns of feeding at shallow, highly oxygenated depth zones during the night (66.1 %, on average, of all feeding events) and at deep, low oxygenated depth zones during the daytime (33.9 % of all feeding events). All seals encountered OLZ and OMZ during daytime dives, and fed in both OLZ (66.7 %, on average, of all daytime feeding events) and OMZ (20.6 %). During daytime, feeding efficiency, defined here as the number of feeding events per unit time spent at each DO level (binned at 0.1 mg/L), was highest in the OLZ and OMZ for four and five seals, respectively. We suggest that both OLZ and OMZ provide important food resources to female northern elephant seals during their post-breeding migration across the northeast Pacific Ocean.