DEEP DIVING ODONTOCETES FORAGING STRATEGIES AND THEIR PREY FIELD AS DETERMINED BY ACOUSTIC TECHNIQUES

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ABSTRACT

Deep diving odontocetes, like sperm whales, beaked whales, Risso's dolphins, and pilot whales are known to forage at deep depths in the ocean on squid and fish. These marine mammal species are top predators and for this reason are very important for the ecosystems they live in, since they can affect prey populations and control food web dynamics through top-down effects. The studies presented in this thesis investigate deep diving odontocetes' foraging strategies, and the density and size of their potential prey in the deep ocean using passive and active acoustic techniques. Ecological Acoustic Recorders (EAR) were used to monitor the foraging activity of deep diving odontocetes at three locations around the world: the Josephine Seamount High Sea Marine Protected Area (JHSMPA), the Ligurian Sea, and along the Kona coast of the island of Hawaii. In the JHSMPA, sperm whales' and beaked whales' foraging rates do not differ between night-time and day-time. However, in the Ligurian Sea, sperm whales switch to night-time foraging as the winter approaches, while beaked whales alternate between hunting mainly at night, and both at night and at day. Spatial differences were found in deep diving odontocetes' foraging activity in Hawaii where they forage most in areas with higher chlorophyll concentrations. Pilot whales (and false killer whales, clustered together in the category "blackfishes") and Risso's dolphins forage mainly at night at all locations. These two species adjust their foraging activity with the length of the night. The density and size of animals living in deep sea scattering layers was studied using a DIDSON imaging sonar at multiple stations along the Kona coast of Hawaii. The density of animals was affected by location, depth, month, and the time of day. The size of animals was influenced by station and month. The DIDSON proved to be a successful, non-invasive technique to study density and size of animals in the

deep sea. Densities were found to be an order of magnitude higher than previously found with trawls, and sizes of animals were found to be 3-4 times larger than in trawl data.