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Large scale, multi-decade monitoring data from kelp forest ecosystems in California and Oregon (USA)

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Abstract: Kelp forests are among the most productive ecosystems on Earth. In combination with their close proximity to shore, the productivity and biodiversity of these ecosystems generate a wide range of ecosystem services including supporting (e.g., primary production, habitat), regulating (e.g., water flow, coastal erosion), provisioning (e.g., commercial and recreational fisheries), and cultural (e.g., recreational, artisanal) services. For these reasons, kelp forests

have long been the target of ecological studies. However, with few exceptions, these studies have been localized and short-term (< five years). In 1999, recognizing the importance of large scale, long-term studies for understanding the structure, functioning, and dynamics of coastal marine ecosystems, and for informing policy, the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) designed and initiated a large scale, long-term monitoring study of kelp forest ecosystems along 1400 km of coast stretching from southern California to southern Oregon, USA. The purpose of the study has been to characterize the spatial and temporal patterns of kelp forest ecosystem structure and evaluate the relative contributions of biological and environmental variables derived from external sources (e.g., sea otter density, Chl-a concentration, sea surface temperature, wave energy) in explaining observed spatial and temporal patterns. For this purpose, the ecological community (i.e., density, percent cover, or biomass of conspicuous fishes, invertebrates, and macroalgae) and geomorphological attributes (bottom depth, substratum type, and vertical relief) of kelp forest ecosystems have been surveyed annually using SCUBA divers trained in both scientific diving and data collection techniques and the identification of kelp forest species. The study region spans distinct ecological and biogeographic provinces, which enables investigations of how variation in environmental drivers and distinctive species compositions influence community structure, , and its response to climate-related environmental change across a portion of the California Current Large Marine Ecosystem. These data have been used to inform fisheries management, design and evaluate California's state-wide network of

marine protected areas (MPAs), and assess the ecological consequences of climate change (e.g., marine heatwaves). Over time, the spatial and temporal design of the monitoring program was adapted to fill its role in evaluating the ecological responses to the establishment of MPAs. There are no copyright restrictions; please cite this paper when data are used.

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