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FOSW Environmental Impact Assessment and Minimization

Re: areas of environmental research are most critical to support sustainable development of FOSW

Stakeholders and resource managers involved with the development of offshore marine renewable energy (MRE) in California must consider the inevitable biological effects associated with these massive offshore infrastructure projects. Evaluating proposed projects requires an understanding of potential impacts associated with new offshore structures and this can be gained from comprehensive investigation of what can be learned from existing artificial marine habitats in California? It remains unclear how the ecological performance (e.g., growth rates, reproductive output) differs between fishes living associated with natural and artificial reef habitats. Further, to what extent do artificial structures such as offshore wind, oil and gas platforms, shipwrecks and other marine infrastructure contribute to regional-scale ecological dynamics. This is due in part to the lack of a comprehensive understanding of the extent of man-made habitat available and variation in the quality of these habitats across the region. An understanding of how local features interact with regional drivers would enable suitable forecasts about the consequences of decisions related to marine infrastructure and support environmental review.

More specifically, rockfishes and other reef fish species recruit to (from their planktonic larval/juvenile stage) relatively shallow hard substrates, whether they be rocky reefs or steal structures (Love et al. 2012). Depending on the species, they can spend months to years associated with these habitats. Many rockfish species then move deeper as they grow older, relocating to deeper rocky reefs or the bases of oil platforms at the seafloor (Love et al. 1990; Love et al. 2003). In assessing the potential ecological impacts on reef associated fishes for the proposed deployment of FOSW technologies offshore of California, both the abundance of fish living associated with these structures and their ecological performance (e.g., growth, body condition) relative to natural reef habitats are important considerations (Carr et al. 2003; Schroeder and Love 2004; Nelson et al. 2008; Claisse et al. 2014). Until anchored floating renewable energy structures are deployed there will be no empirical data concerning how fish assemblages will respond to them. They may or may not differ from the closest proxy, the shallow portions of offshore oil and gas platforms in California that are fixed to the seafloor. Some evaluations of the potential ecological impacts of FOSW developments suggest that floating FOSW structures will tend to act primarily as buoys or FADs, aggregating pelagic species for relatively short time periods (Boehlert et al. 2013). This may be a more appropriate assumption for the spar-buoy style floating offshore wind systems with only a single vertical column and no cross beams (i.e., only a negligible amount of submerged horizontal structure), however, other offshore floating wind turbine designs have a considerable amount of submerged horizontal structure that closely resemble the structures of existing offshore oil and gas platforms. These floating turbine platforms have multiple steel structural columns that descend from 20 m, to potentially over 25 m, below the water surface (depending on the size of the turbine above the water), are 50 m apart, and connected by horizontal and diagonal crossbeams (George 2014). They also have â€œwater entrapment platesâ€ that extend out horizontally from the bottom of each column and resemble the horizontal piling guides on the midwater portions of oil platform Eureka. This added habitat complexity correlates with higher abundances of reef associated fishes occupying this platform throughout the water column. These large floating wind systems therefore have the potential to provide substantial reef habitat for the same fishes observed living associated with the shallow portions of offshore oil platforms, namely young-of-the-year (YOY) rockfishes and some adult fish species that typically associate with nearshore rocky reef habitats, including a variety of federally managed groundfish species important to commercial and recreational fisheries (Carr et al. 2003; Love et al. 2003; Martin and Lowe 2010; Love et al. 2012).

In California, the shallow habitats of offshore oil and gas platforms provide the best available habitat proxy to investigate the environmental conditions fishes will experience living associated with the large floating steel platform structures that support offshore wind turbines being evaluated for deployment. A key questions remains as to how ecological performance metrics (e.g., age-specific growth rates, body condition) compare between a variety reef-associated fishes from offshore platforms and nearshore reefs (natural rocky reefs and breakwaters). This understanding will have applications for many state and federal agency processes associated with MRE deployment at pilot and commercial scales including CEQA, NEPA and the development of monitoring plans. Further, integrating an understanding of these biological processes during these early planning and evaluation stages affords industry stakeholders and managers a unique opportunity to maximize potential ecological benefits of future FOSW projects in California as there may be opportunities through smarter design of FOSW technologies that integrate what we can learn from existing artificial reef structures on many types in California.