Reef Check California Report:

Laguna Beach Coastal Kelp Forest Evaluation

Final Report To: Laguna Bluebelt Coalition

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Introduction

The Laguna Beach State Marine Reserve (SMR) and the Laguna Beach State Marine Conservation Area (SMCA) (No-Take) were both established in January 2012 as a part of California's Marine Protected Area (MPA) network (Figure 1). The Laguna Beach SMR protects more than six square miles of marine habitat and covers 4.4 miles of coastline. It extends from Abalone Point, Laguna Beach's northernmost city limit, south to Goff Island. Inside the boundaries of the SMR all recreational and commercial fishing is prohibited. The Laguna Beach SMCA (No-Take) extends south from Goff Island to Table Rock and protects more than 3 square miles of marine habitat and covers 1.2 miles of coastline (California Department of Fish and Wildlife 2022). Inside the Laguna Beach SMCA (No-Take) recreational and commercial fishing is prohibited, but take is allowed when incidental to permitted activities. Though these two MPAs cover most of the shoreline of Laguna Beach, there is an additional mile of coastline where offshore kelp forests remain open to recreational and commercial fishing activity. This final mile of Laguna Beach is inside the boundaries of the Dana Point SMCA, where take from tidepools is prohibited, but recreational fishing of finfish, lobster, and urchin is allowed, as is commercial fishing of lobster, urchin, and certain pelagic fish species.

This report was designed to compare Laguna Beach kelp forest ecosystems found outside of the Laguna Beach SMR and SMCA (No-Take) to kelp forest ecosystems inside those MPAs. Specifically, we will be comparing the communities found at six sites; four sites located within the Laguna Beach SMR (Seal Rock, Shaws Cove, Divers Cove, Heisler Park) and two sites located south and outside of the Laguna Beach SMCA (No-Take) (Thousand Steps, Three Arches).

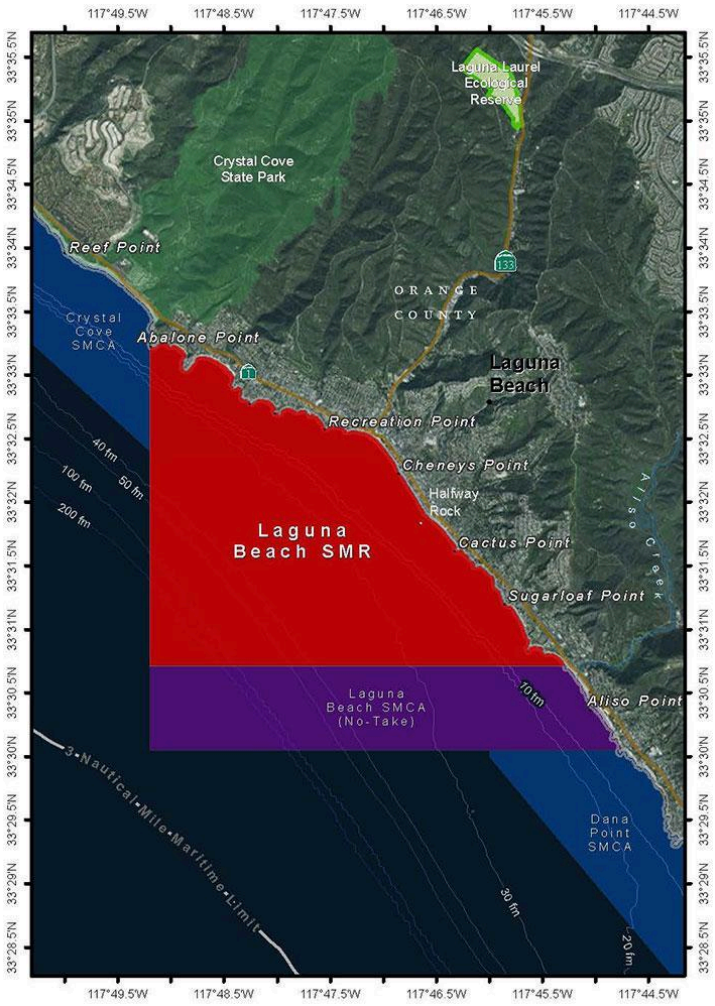

Figure 1. Map showing the current boundaries of the Laguna Beach SMR, Laguna Beach SMCA (No-Take), and Dana Point SMCA.

Reef Check Methods

To assess the kelp forest ecosystems, Reef Check divers completed biotic surveys at each of the six sites. All surveys were completed following the Reef Check California Monitoring Protocol (Freiwald et al. 2021). Each survey included six 30m by 2m swath transects on which divers conducted counts of fish, invertebrates, macroalgae, and made uniform point contact (UPC) observations. Data on substrate, relief, and cover (sessile organisms) were collected at every meter during each UPC survey. Transects were placed at each survey site in predetermined depth zones, three shallow and three deep. An additional 12 fish transects (30m by 2m and by 2m) were conducted during each survey. Along each transect, a set of 83 indicator species, comprising of 13 species of macroalgae, 35 taxa of invertebrates, and 35 taxa of fish, were looked for and counted. Reef Check indicator species have been selected because they are ecologically important and of relevance to management (Freiwald and Beahrs 2020).

Reef Check long-term monitoring data was also used to examine changes in the kelp forest communities of the four sites located within the Laguna Beach SMR since the establishment of the MPA in 2012.

Giant Kelp Trends

In Southern California, giant kelp (*Macrocystis pyrifera*) forms kelp forest canopies. Since the establishment of the Laguna Beach SMR and SMCA (No-Take) in 2012, all four monitored sites have shown a slight positive trend in giant kelp density (Figure 2). Looking specifically at data collected in 2025 and 2026, the four sites inside the Laguna SMR have notably higher giant kelp densities than those at Thousand Steps Beach and Three Arches (Figure 3).

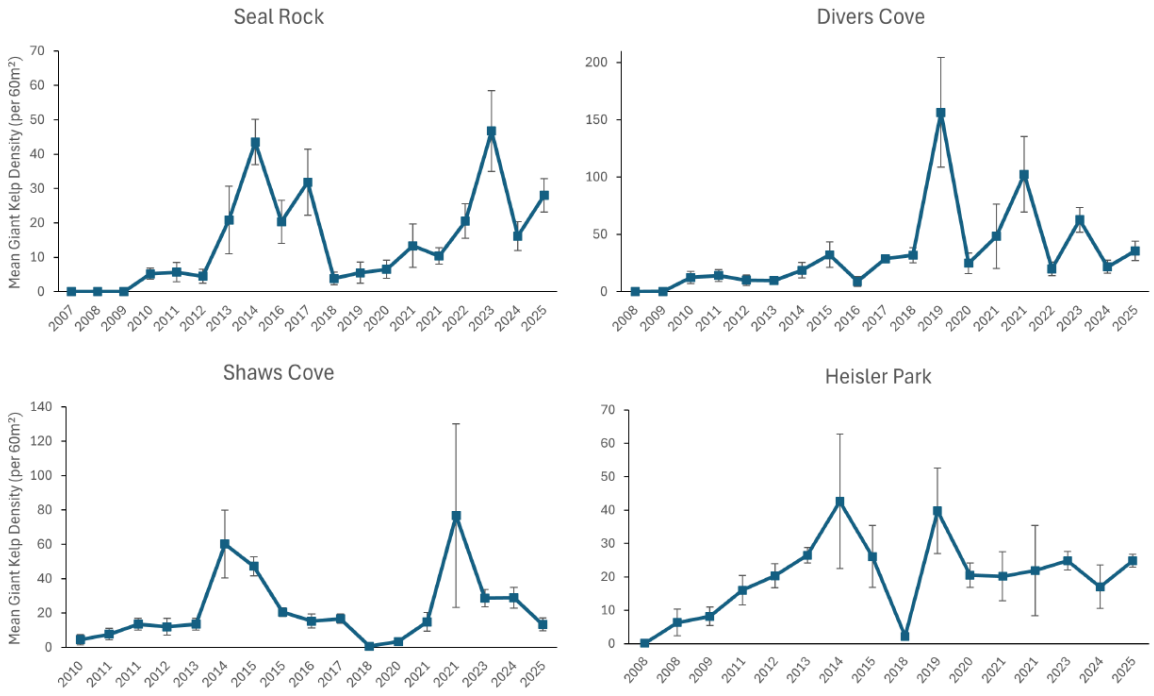

Figure 2. Giant kelp densities over time at four long-term monitoring sites in Laguna Beach, California. Error bars represent the standard error of the mean.

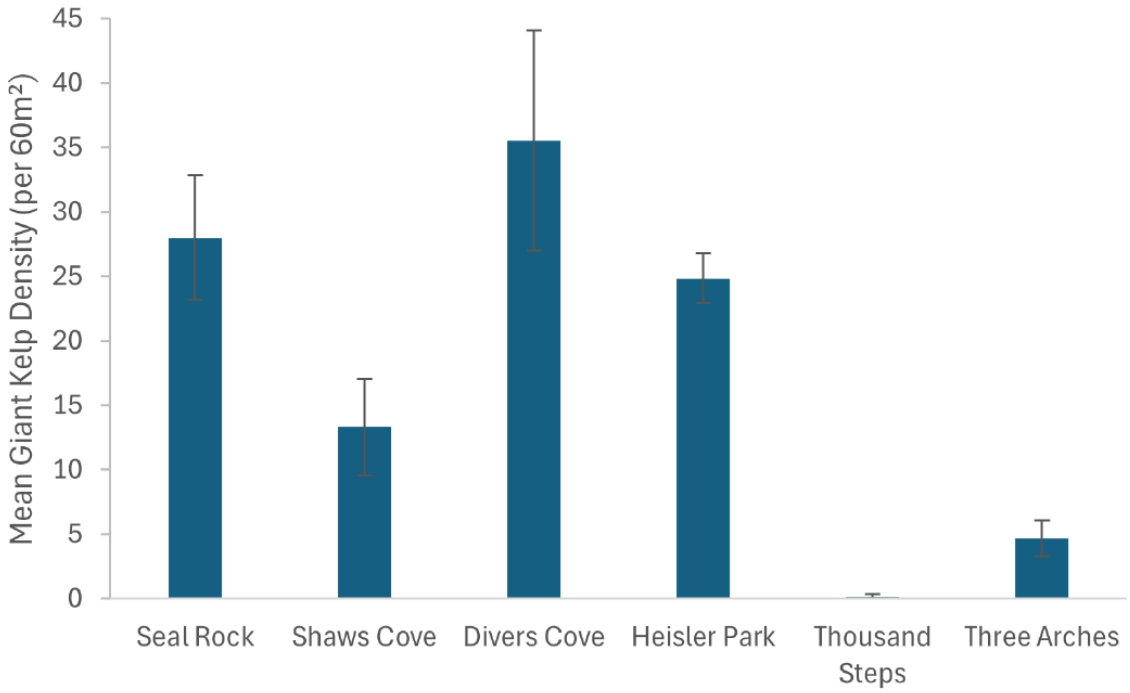

Figure 3. Mean giant kelp density at six sites in Laguna Beach, California, based on the most recent survey data (2025 and 2026). Error bars represent the standard error of the mean.

Sea Urchin Trends

Reef Check monitors four species of urchin in California: purple urchins (*Strongylocentrotus purpuratus*), red urchins (*Mesocentrotus franciscanus*), starry urchins (*Arbacia stellata*), and crowned urchins (*Centrostephanus coronatus*). Purple, red, and crowned urchins are commonly observed in southern California. Starry urchin, though, are rare in California. Starry urchin have only been recorded during Reef Check surveys in southern California at sites off Anacapa and Santa Cruz Islands. Over 19 years of monitoring, starry urchin have never been recorded at Reef Check sites located in the Laguna Beach SMR.

Since the establishment of the Laguna Beach SMR and SMCA (No-Take) in 2012, all four long term monitoring sites have seen a decline in both purple and red urchin densities (Figure 4). If we look specifically at urchin density data collected in 2025 and 2026, the four sites inside the Laguna Beach SMR have notably smaller densities of both purple and red urchins than the two sites located inside the Dana Point SMCA (Figure 5). Small amounts of crowned urchins were recorded at Seal Rock, Shaws Cove, Divers Cove, and Three Arches. Interestingly, starry urchins were recorded for the first time at a Laguna Beach site at Three Arches in 2026 (Figure 5).

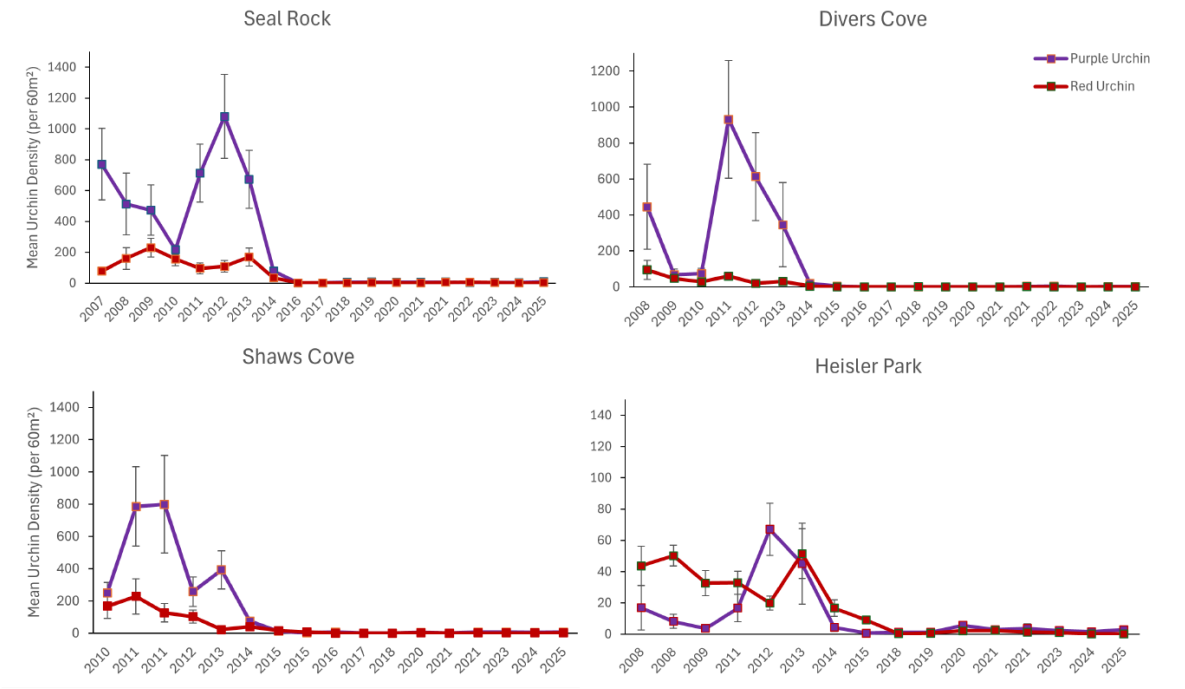

Figure 4. Purple and red urchin densities over time at four long-term monitoring sites in Laguna Beach, California. Error bars represent the standard error of the mean.

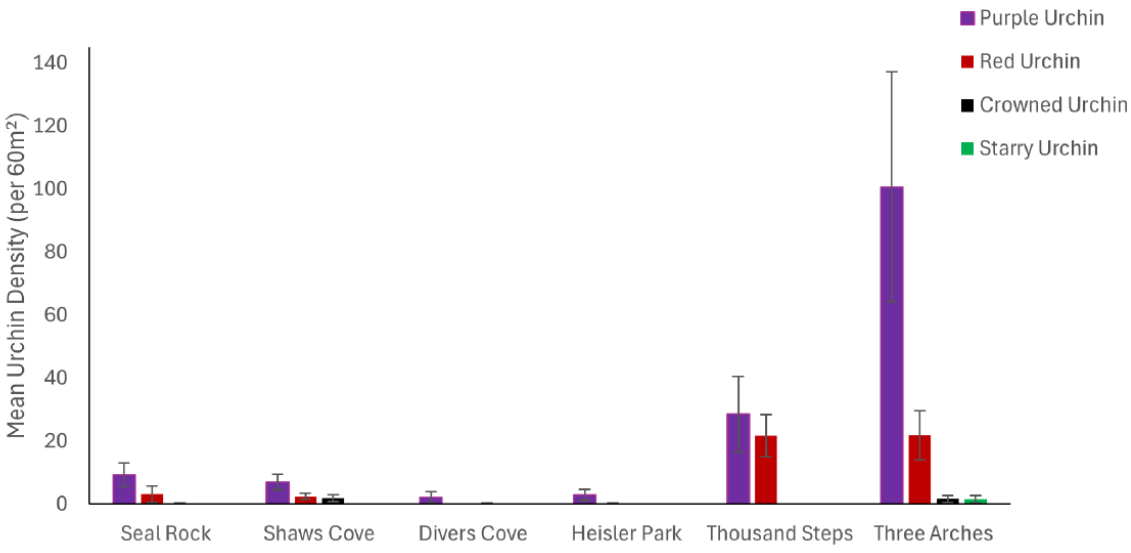

Figure 5. Mean urchin density at six sites in Laguna Beach, California, based on the most recent survey data (2025 and 2026). Error bars represent the standard error of the mean.

Reef Habitat Characterization

Uniform Point Contact (UPC) surveys were used to collect substrate data at each site. Substrate was recorded based on the size of the substrate at each point, ranging from sand (rock<0.5cm) to reef (rock>1m). The four sites located within the Laguna Beach SMR and Three Arches were mainly composed of large substrate, with all 5 sites characterized by over 50% rocky reef. Thousand Steps Beach was characterized by more medium-sized substrate, with 50% cobble (rock< 15 cm) and only 30% rocky reef (Figure 6).

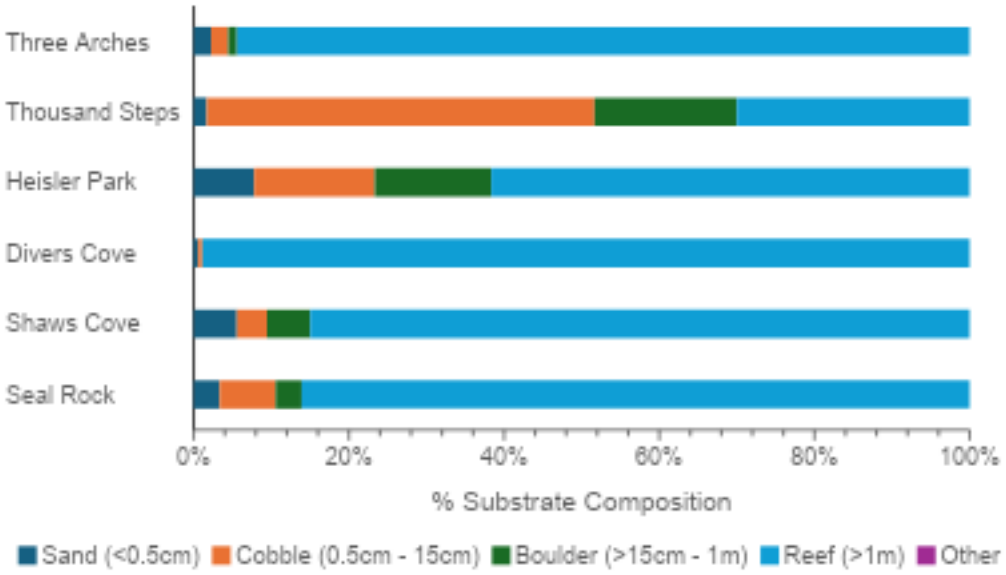

Figure 6. Mean percent substrate composition at six sites in Laguna Beach, California, based on the most recent survey data (2025 and 2026).

Conclusions

Overall, this report finds that the kelp forest ecosystems inside the Laguna Beach SMR have stable giant kelp densities and currently have higher giant kelp densities than the ecosystems surveyed at Thousand Steps Beach and Three Arches. The protected ecosystems also currently have lower urchin densities than the reefs located inside the Dana Point SMCA. The higher urchin populations outside of the Laguna Beach SMR and SMCA (No-Take) may have led to increased grazing pressure on the algae communities of these ecosystems. If there is not enough drift algae to support urchin grazing, urchins are known to actively search for food and may graze on attached giant kelp holdfasts, resulting in a decline in giant kelp density (Harrold and Reed 1985). The fishing pressure on urchin predators, such as California spiny lobster *(Panulirus interruptus*) and California sheephead (*Bodianus pulcher*), at sites inside the Dana Point SMCA may allow larger populations of urchins to thrive on those reefs. Continuing to monitor these six sites will allow us to better understand the impacts of MPAs on the dynamics of these kelp forest ecosystems.

References

Freiwald, J., and A. Beahrs. 2020. Reef Check California: SCUBA-diving citizen scientist monitor rock reef ecosystems. Page 313 in C. A. Lepczyk, O. D. Boyle, and T. L. V. Vargo, editors. Handbook of citizen science in ecology and conservation. University of California Press, Oakland, California.

Freiwald, J., S. M. McMillan, and D. Abbott. 2021. Reef Check California Instruction Manual: A Guide to Monitoring California's Kelp Forests, 10th Edition. Reef Check Foundation, Marina del Rey, CA, USA.

Harrold, C., and Reed, D. C. (1985). Food availability, sea urchin grazing, and kelp forest community structure. Ecology, 66(4), 1160-1169.

California Department of Fish and Wildlife. (2022, September). Laguna Beach State Marine Reserve/State Marine Conservation Area (No-Take). California Natural Resources Agency. https://wildlife.ca.gov/Conservation/Marine/MPAs/Laguna-Beach#623964928