**Petition to Modify the CA Marine Protected Area Network
to Enhance Protections for California's Most Resilient Kelp Forests**
Joint Submission by Environment California and Azul

PETITION NARRATIVE

Overview

California has experienced severe losses of its kelp forests since the designation of its statewide MPA network. At the time the MPA network was established, we could not know which kelp beds would be most resilient in the face of climate-related threats. However, in light of new data and research identifying the location of the state's persistent and stable kelp beds, adaptive management of the MPA network to better protect these kelp areas is therefore of critical importance.

This petition seeks to strengthen the statewide MPA network's protections for California's most resilient, stable, and persistent kelp forest patches – preserving what we have left now, to increase our chances of successful restoration in the future. Removing, to the extent possible, direct human impacts on these resilient kelp forests that are potential climatic refuges will not only help these areas persist, but will also enhance the state's restoration efforts for other kelp forests in decline. These efforts will also benefit kelp-forest dependent species, such as endangered Southern sea otters and threatened species of abalone. By focusing resources on the immediate protection of already identified important areas with outsized conservation benefits, the state can advance the goals of the Marine Life Protection Act, advance the new 30x30 target, and take a cost-effective approach to kelp restoration by protecting the natural regeneration potential of kelp forest ecosystems statewide.

Importance and decline of California's kelp forests

California's kelp forests provide numerous and invaluable ecological and environmental benefits. These underwater ecosystems serve as critical nurseries for a wide variety of marine species, providing shelter and food for numerous fish, invertebrates, and marine mammals, including the endangered Southern sea otter. Kelp acts as a natural water filter, as it absorbs excess nutrients and helps maintain water quality by reducing the risk of harmful algal blooms. Kelp forests may also play a role in carbon sequestration, capturing atmospheric carbon dioxide and helping to mitigate climate change. In addition to their ecological importance, kelp forests offer enormous cultural and economic benefits to California. They hold enormous cultural and economic significance for many of the Tribes and Indigenous communities that call California's coastal waters home. They support thriving commercial and recreational fisheries, contributing to the state's economy. The beauty and biodiversity of these forests attract tourists and divers, bolstering the state's tourism industry. Moreover, kelp can act as a buffer against coastal erosion, protecting shorelines from the damaging impacts of storms and waves.

However, kelp forests in California have experienced a significant decline in recent years due to a combination of natural and human-induced factors. One of the most important drivers of this decline is the warming of ocean waters, which has been linked to climate change. Sustained elevated sea temperatures known as "marine heatwaves" have caused significant stress to kelp populations, leading to widespread loss of kelp stands, increased susceptibility of key urchin predators to disease, and exploding populations of herbivorous sea urchins. The recent 2014-2016 marine heatwave left California's kelp forests decimated, with over 90% of bull kelp reported lost in Northern California and significant losses reported across the state (Bell et al. 2023, Arafeh-Dalmau et al. 2023). Human activities have also played a role in the degradation of kelp forests. Overfishing and removal of key predators like sea otters, predatory fishes, California spiny lobster, rock crab, and sea stars have disrupted food webs and resulted in trophic cascades in these ecosystems, allowing herbivorous species to graze on kelp unchecked. Additionally, coastal development, pollution, and nutrient runoff degrade water quality and promote the growth of invasive species that outcompete native kelp. The loss of kelp cover across the state has widespread economic and ecological impacts, has led to the closure of the recreational red abalone fishery in Northern California and has hindered Southern sea otter population expansion, as great white shark bite mortalities increase where kelp cover has declined at the northern and southern edges of this iconic species' range (Nicholson et al. 2018, Moxley et al. 2019).

The decline of California's kelp forests since the time the MPA network was completed seriously threatens the state's marine biodiversity, fisheries, and overall ecological health and undermines the goals of the Marine Life Protection Act. This adaptive management review cycle is critically timed to respond to kelp loss. It is vital to increase protections immediately to confer as much resilience as possible to future disruptions.

MPAs and kelp forest conservation

Around the world, MPAs have been found to enhance the overall health and resilience of ocean ecosystems (Edgar et al. 2014, Jacquemont et al. 2022), and to promote long-term kelp forest stability (Peleg et al. 2023). By providing long-term protections for predator species within their boundaries - such as southern sea otters, California spiny lobster, rock crabs, wolf eels, and predatory fishes like California sheephead - MPAs help to regulate local populations of kelp consumers, thereby having cascading positive impacts on kelp growth and persistence (Eisaguirre et al. 2020, Kawamata & Taino 2021, House & Allen 2022, Heineke et al. 2023). Promoting intact food webs and natural ecological processes can also help to improve overall resilience in the face of other natural and man-made stressors that MPAs cannot directly mitigate, such as warming ocean temperatures and nutrient runoff (Roberts et al. 2017, Arafeh-Dalmau et al. 2023). Noting these benefits and abilities, the California MLPA specifically identified kelp forests as one of the habitats requiring greater protection (MLPA Section 2856(a)(2)(A)).

We have seen the benefits of long-term protection of California's kelp forests. The Decadal Management Review of the statewide MPA network found that, while kelp species across the

state experienced large-scale declines during the 2014-2016 marine heatwave, "overall, kelp canopy was more stable and appeared to be more resilient inside MPAs" (CA MPA DMR 2022). The South Coast region's kelp forests, in particular – where fishing pressure was highest before the implementation of the MLPA – seem to have benefited from protections, with increases in California sheephead and California spiny lobster within MPAs thought to help facilitate grazer suppression and lead to more stable giant kelp abundance during and after the marine heatwave (DMR Kelp Forest Technical Report 2021).

MPAs can also serve as a complementary management measure for kelp restoration. While California's MPAs were not explicitly designed with the restoration of kelp forests in mind, MPAs in general are considered a form of indirect kelp restoration due to their ability to promote intact food webs through reduced fishing pressure, which in turn helps to reduce kelp grazing pressure, as described above (Hopf et al. 2022). In addition, stable kelp forests help to promote natural regeneration of nearby areas, by providing a supply of propagules to recovering populations close by (Arafeh-Dalmau et al. 2021, Giraldo-Ospina et al. 2023). A recent global synthesis of kelp restoration found that the most successful restoration projects are those located near existing stable kelp forests (Eger at al. 2022). MPAs that protect these stable kelp forests can help to promote their continued persistence by removing extractive or destructive activities, and potentially further boost kelp restoration efforts by promoting healthy predator populations that "spillover" into nearby areas (e.g. Lenihan et al. 2021), helping to reduce grazer pressure in a broader area (Kawamata & Taino 2021). Harnessing the power of these dense, stable, and resilient kelp beds for the natural regeneration of nearby areas using area-based protection can also free up much-needed resources needed for intensive, direct restoration efforts elsewhere.

Based on this new and growing scientific evidence base, the state should protect more of California's most stable and resilient kelp forests now, in order to enhance the conservation benefits and ability of our statewide MPA network to meet the goals of the MLPA while giving kelp restoration efforts a leg up in the future.

Identifying resilient kelp forests in California

Since the creation of California's MPA network, new research has emerged utilizing satellite and in-situ data over a decades-long year timescale to identify the kelp forests exhibiting higher levels of persistence and stability in California.

A multi-institution team of researchers used satellite data to provide high-resolution maps of the most persistent giant kelp and bull kelp patches in California during the last 35 to 38 years (Arafeh-Dalmau et al. 2021, Arafeh-Dalmau et al. 2023). Importantly, these studies analyzed the extent to which highly persistent kelp patches are protected within the state's MPA network, and found that these important kelp forest areas are currently not adequately protected among regions. Only 20.9 % of the most highly persistent giant kelp forests in Central California, 8.4% in Southern California, and less than 1% in Northern California are fully protected in MPAs (Arafeh-Dalmau et al. 2021). Bull kelp is even less well protected – only 3.4% of the the most

highly persistent bull kelp forests in Northern Central California, and 0.1% of those in Northern California are fully protected in MPAs (Arafeh-Dalmau et al. 2023). The authors of these studies recommend increasing protections for these important and highly persistent kelp forest areas.

In addition, the Ocean Protection Council recently funded the development of an ecologically-focused, spatially explicit prioritization tool to identify priority kelp restoration sites in California waters (Giraldo-Ospina et al. 2023). Notably, this research used in-situ data as well as satellite imagery to determine the stability and current status of kelp forests across California's coastline, making the resulting prioritization index particularly robust. Of particular importance to this petition, the tool identifies kelp beds that have been historically stable, that persisted or bounced back quickly during the 2014-2016 marine heatwave, and that are currently doing well compared to other kelp forests – namely, the most stable and resilient kelp forest areas in state waters. Characterized as "medium priority" restoration sites – that is, historically stable kelp beds that are currently in good condition – these areas have a large potential for enhancing the natural regeneration and/or successful restoration actions of nearby kelp beds. The authors suggest potential actions: "Monitor these sites for triggers that may warrant intervention; Defend these sites from current or future threats; and Study these sites to understand the mechanisms of resistance to the marine heatwave."

In light of these new studies, and in line with the site classifications put forth by Giraldo-Ospina et.al, we strongly recommend the state take action to protect as much of these newly-identified, stable, highly resilient kelp forest patches as possible with well-protected MPAs in the coming years. Protecting these iconic, dense kelp beds is one of California's best shots at preserving – and eventually restoring – our critically important kelp forest ecosystems quickly and cost-effectively.

Proposed areas for additional or enhanced MPA protections

Using spatially-explicit data detailing where highly persistent kelp beds and "medium priority" restoration sites overlap, as outlined by Arafeh-Dalmau et al. 2021, 2023, and Giraldo-Ospina et al. 2023, we identified areas where additional protections are necessary to promote the continued persistence and stability of California's healthiest kelp forests (see Table 1).

Preference was given to areas already within or adjacent to existing California MPAs, recognizing the substantial scientific and stakeholder input involved in creating the original network through the MLPA process, and in order to adhere as much as possible to the original intent and science-based spacing guidelines provided by the SAT during the creation of the network. We recommend reducing spacing between MPAs in some places is necessary to increase the representation of these highly persistent and resilient kelp beds that have a greater chance of persisting into the future in our state MPA network. We also encourage the state to consider whether there are other areas of highly persistent and resilient kelp not included in this proposal that would be good candidates for new or expanded MPA protections.

To develop the proposal further, we collected information through interviews and other personal

communications with scientists including Dr. Anita Giraldo-Ospina and Dr. Nur Arafeh Dalmau, who graciously provided data, assisted with the interpretation of results to identify the recommended areas, and reviewed the proposal for accuracy. We also gathered expert input and data from individuals, local community groups, MPA Collaborative Network members, conservation organizations, and more. While their cooperation should not be taken as an endorsement, we greatly appreciate the information and guidance provided by these individuals which contributed to the overall accuracy and scientific validity of this proposal.

We did not focus on "high priority" restoration sites identified by Giraldo-Ospina et al. 2023, in order to avoid proposing MPA protections for areas that may require more intensive, direct restoration methods, such as grazer suppression activities, that are not currently permitted within MPA boundaries. However, we urge the state to consider what, if any, direct restoration activities might be compatible with different MPA designations within the state's network (e.g. line 20 of the [MPA Collaborative Network's Vetted Regulation Recommendations](#)), recognizing that the impacts of climate change may still degrade some kelp beds within MPAs in the future, and proactive restoration efforts may be warranted.

Finally, it should be noted that, while the general location and specific boundaries for proposed areas are listed in Table 1, we are happy to work with State and its partners to define the proposed areas and boundaries in more detail, keeping in mind CDFW MPA design guidelines and the state's interest in taking a holistic approach for reviewing petitions and enhancing the network to meet the statewide 30x30 goal.

Socioeconomic impacts

Enhanced, long-term protection of highly resilient kelp forest areas will bolster the diverse stakeholders, interests and industries that benefit from our coastal marine resources. Low-impact, non-consumptive recreational activities such as diving, snorkeling, and surfing will be unaffected – and even enhanced – by expanded MPAs, which will also provide enhanced research and education opportunities. Short-term impacts to recreational and commercial fishermen will be outweighed by larger benefits in the future, as has been demonstrated here in California and around the world (Bucaram et al. 2018, Lenihan et al. 2021, Medoff et al. 2022). For example, an analysis of CDFW fisheries data found that regional and statewide fishery landings and values do not appear to have been negatively impacted by MPAs (Murray and Hee 2019), and an analysis of California spiny lobster fishery found that any short-term losses were compensated for by a 225% increase in total catch after 6 years of MPA designation (Lenihan et al. 2021).

Relevance to MLPA Goals and DMR Recommendations

Enhancing the protection of kelp forests in California aligns strongly with Goals 1, 2, 3, and 4 of the California MLPA. By safeguarding California's most resilient and stable kelp forests, as detailed in this petition, we will preserve critical habitat for a diverse range of marine species, from endangered sea otters to commercially valuable fish species. Kelp forests play a crucial

role in the recovery and sustainability of marine life populations, as they serve as nurseries and refuges for many species, including those targeted by fisheries. These vibrant ecosystems also offer intrinsic value by supporting biodiversity and exceptional natural beauty, and their recreational and scientific use and enjoyment make them vital for the public ([MLPA Section 2856(a)(2)(A)](#)).

In addition, the regulation and boundary changes proposed by this petition specifically advance DMR Recommendation #4 - "Apply what is learned from the DMR to support proposed changes to the MPA Network and Management Program". The DMR found that California MPAs helped to promote kelp forest resilience and recovery during and after the severe 2014-2016 marine heatwave. In the face of increasing climate impacts and as we struggle to recover from recent kelp forest declines across the state, expanding the MPA network in key, targeted areas can help to ensure the continued persistence of our remaining, most resilient kelp forests.

Relevance to Broader State Processes, Policies, and Goals

We applaud the actions that the State of California has already taken to respond to the severe declines in kelp forest cover across the state, including recent commercial kelp harvest closures in Northern California, annual harvest limits in Northern California, and the initiation of a statewide Kelp Restoration and Management Plan. We strongly support taking a whole-ocean approach to ensuring sustainable and effective management of kelp in our state waters ([Crowfoot et al. Objective 3.2](#)).

The MPA changes proposed in this petition complement the state's ongoing kelp restoration and management work. They will also help to reduce the state's costs associated with kelp restoration – harnessing the ability of well-protected, resilient kelp beds to promote the natural regeneration of nearby areas, allowing the state to direct more of its much-needed resources and funding for intensive restoration efforts in harder-hit areas with little kelp cover left.

Finally, this petition aligns strongly with the statewide goal set by both Governor Newsom and the legislature to conserve 30% of our coastal waters by 2030. If implemented in its entirety, the actions proposed in this petition will see an additional ~1.5% of state waters protected in highly- to fully-protected areas, while helping the network to better achieve the goals set forth in the MLPA.

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