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## A rising tide: California's ongoing commitment to monitoring, managing and enforcing its marine protected areas

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### ABSTRACT

In 2012, California completed its marine protected area (MPA) planning and designation process, yielding a network of 124 MPAs from the Mexican border to Oregon. The management effort that has followed is comprehensive and strategic, with a focus on scientific monitoring, interagency coordination, public education and outreach, and enforcement. Initial monitoring results show more and bigger fish, especially in older MPAs where the benefits of limiting fishing have had longer to accrue. Today, California state agencies increasingly acknowledge and contemplate MPA protections in their permitting decisions, as regional and statewide outreach and education efforts enhance public awareness, social capital and stewardship. While enforcement remains challenging in a marine region as large and populous as California, the state has taken important steps to promote compliance with new MPA regulations and—with the support of the state legislature—has strengthened laws to address poaching. As new MPAs are established throughout the world in accordance with global targets, California's post-designation efforts provide a valuable and educational case study for local, national and international MPA managers.

### 1. Introduction

Between 2004 and 2012, California designed and adopted its system<sup>1</sup> of marine protected areas (MPAs) through four sequential<sup>2</sup> regional planning efforts,<sup>3</sup> thereby implementing the Marine Life Protection Act (MLPA), a state law adopted in 1999 with bipartisan support.<sup>4</sup> After eight years of public process and significant financial

investment by the state and its philanthropic partners,<sup>5</sup> California's MPA network was completed in December of 2012.<sup>6,7</sup>

The stakeholder-driven process to create California's system of protected areas—the first science-based, statewide MPA network in the U.S.—is well documented in academic and policy publications.<sup>8</sup> Many authors highlight the comprehensive approach California used to integrate regional scientific knowledge,<sup>9</sup> engage local communities,<sup>10</sup> and

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<sup>1</sup> An assortment of MPAs pre-existed this planning effort, but many lacked clear goals and were too permissive or small to be effective. These pre-existing MPAs were evaluated for effectiveness as a part of the MLPA planning process.

<sup>2</sup> The first planning effort occurred in the Central Coast in 2004, with subsequent efforts occurring in the North Central Coast, South Coast and North Coast, respectively.

<sup>3</sup> <https://www.wildlife.ca.gov/Conservation/Marine/MPAs#40713403-mlpa>, accessed June 18, 2019.

<sup>4</sup> California Fish and Game Code Sections 2850-2863 (1999).

<sup>5</sup> The MLPA process was funded by a public-private partnership led by Resources Legacy Fund through its supporting organization the Resources Legacy Fund Foundation with support from the David and Lucile Packard Foundation, Keith Campbell Foundation for the Environment, Gordon and Betty Moore Foundation, Marisla Foundation and Annenberg Foundation. RLFF worked under a memorandum of understanding with the California Department of Fish and Wildlife and California Natural Resources Agency to help finance and administer MPA planning process.

<sup>6</sup> The Central Coast MPAs were implemented in 2007, followed by the North Central Coast in 2010, South Coast in January 2012 and North Coast in December 2012.

<sup>7</sup> A separate process led to the designation of MPAs at the Channel Islands in 2003; these MPAs were fully incorporated—without amendment—into the South Coast MPAs that were developed in the MLPA planning process.

<sup>8</sup> For example, John Kirlin et al., *California's Marine Life Protection Act Initiative: Supporting implementation of legislation establishing a statewide network of marine protected areas*, 74 *Ocean & Coastal Management* 3 (2013).

<sup>9</sup> Emily Saarman et al., *The Role of Science in Supporting Marine Protected Area Network Planning and Design in California*, 74 *Ocean & Coastal Management* 45 (2013).

<sup>10</sup> Evan Fox et al., *Adapting Stakeholder Processes to Region-Specific Challenges in Marine Protected Area Network Planning*, 74 *Ocean & Coastal Management* 24 (2013).

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evaluate potential economic impacts,<sup>11</sup> as well as the innovative technologies used to support MPA design and adoption.<sup>12</sup>

Now covering 16% of state waters and 852 square miles,<sup>13</sup> California's 124 MPAs range in size, but many extend from the mean high tide line to three nautical miles offshore, spanning the 1100-mile coastline from the Mexican border to the Oregon border. The MPA network protects important marine habitats and species, where roughly half of the state's MPAs prohibit the take of any marine resources in fully protected "State Marine Reserves" (SMRs) and the other half allow some form of commercial, recreational, and/or Tribal take in "State Marine Conservation Areas" (SMCAs).<sup>14</sup>

Since California's MPA network was completed in 2012, there has been a steady rise in the establishment of protected areas throughout the world. This is largely in response to new international ocean protection targets and coincident with a global rise in philanthropic support for MPAs. For example, the 2011 Convention on Biological Diversity set its Aichi Target 11 at 10% of global ocean protection by the year 2020<sup>15</sup> and the United Nation's Sustainable Development Goal 14 echoes this objective.<sup>16</sup> However, some authors find 10% protection insufficient to meet global conservation and biodiversity goals<sup>17</sup> and a number of scientists and non-governmental organizations (NGOs) call for as much as 30% global MPA coverage by the year 2030.<sup>18</sup>

But as the use of spatial ocean protection expands internationally, some authors warn that "paper parks"<sup>19</sup> that are not fully enforced or actively managed offer only the "illusion of protection."<sup>20</sup> Sala et al. concluded in 2018 that in addition to MPA designations, "changes in management [are] required" in order to reach Aichi Target 11 in a meaningful way that delivers the full suite of conservation benefits MPAs can provide.<sup>21</sup> And in studying 433 global MPAs, Gill, et al. found in 2017 that, "[s]taff and budget capacity [are] the strongest predictors of conservation impact" and "MPAs with adequate staff capacity [have] ecological effects 2.9 times greater than MPAs with inadequate capacity."<sup>22</sup> Indeed, early in the California MPA management effort, some authors speculated on potential financial and capacity challenges the state might face in managing and enforcing its own MPAs.<sup>23</sup> These

<sup>11</sup> J. Wilson White et al., *A Comparison of Approaches Used for Economic Analysis in Marine Protected Area Network Planning in California*, 74 *Ocean & Coastal Management* 77 (2013).

<sup>12</sup> Matthew S. Merrifield et al., *MarineMap: A Web-based Platform for Collaborative Marine Protected Area Planning*, 74 *Ocean & Coastal Management* 67 (2013).

<sup>13</sup> <https://www.wildlife.ca.gov/Conservation/Marine/MPAs/Statistics>, accessed June 18, 2019.

<sup>14</sup> *Id.*

<sup>15</sup> <https://www.cbd.int/sp/targets/rationale/target-11>, accessed June 18, 2019.

<sup>16</sup> <http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-14-life-below-water.html#targets>, accessed June 14, 2019.

<sup>17</sup> Bethan C. O'Leary et al., *Effective Coverage Targets for Ocean Protection*, 9 *Conservation Letters*. 9398 (2016).

<sup>18</sup> World Parks Congress, *A Strategy of Innovative Approaches and Recommendations to Enhance Implementation of Marine Conservation in the Next Decade (2014)*. Available at: <http://worldparkscongress.org/downloads/approaches/ThemeM.pdf>.

<sup>19</sup> Alexis N. Rife et al., *When Good Intentions Are Not Enough ... Insights on Networks of "Paper Park" Marine Protected Areas*, 6 *Conservation Letters* 200 (2013).

<sup>20</sup> Tundi Agardy et al., *Mind the Gap: Addressing the Shortcomings of Marine Protected Areas through Large Scale Marine Spatial Planning*, 35(2) *Marine Policy* 226 (2011).

<sup>21</sup> Enric Sala et al., *Assessing Real Progress Toward Effective Marine Conservation*, 91 *Marine Policy* 11 (2018).

<sup>22</sup> David A. Gill et al., *Capacity Shortfalls Hinder the Performance of Marine Protected Areas Globally*, 543 *Nature* 665 (2017).

<sup>23</sup> Mary Gleason et al., *Designing a Network of Marine Protected Areas in California: Achievements, Costs, Lessons Learned, and Challenges Ahead*, 74 *Ocean & Coastal Management* 90 (2013).

global targets and related cautions underscore the importance of California's post-designation MPA management actions, as well as the value in considering the efforts undertaken to date.

Since completion of its MPA network, California has created and implemented a well-resourced MPA Management Program, which centers on the focal areas known to be most critical for MPA success. By investing in extensive scientific monitoring, establishing a multi-agency coordinating leadership team, engaging in outreach and education, and prioritizing enforcement and compliance, the state is executing a comprehensive strategy focused on partnerships. This paper provides an overview of California's inclusive management approach and explores select case studies where the state has been particularly successful or challenged, with the intention of informing future local, national and international MPA management efforts.

## 2. Science and monitoring

The MLPA identifies six distinct goals that emphasize: diverse and abundant marine life and ecosystems; sustained marine populations; improved recreational and educational opportunities; and natural heritage.<sup>24</sup> Additionally, the law calls for "monitoring, research and evaluation" in selected MPAs to assist in adaptive management of the entire MPA network.<sup>25</sup> California therefore committed to a two-phased monitoring effort focused on baseline (Phase I) and long-term (Phase II) monitoring of the MPA network.

Working with academic institutions, researchers, and other partners, the state invested over \$16 million<sup>26</sup> in 37 ecological, biological, and socioeconomic baseline characterization projects between 2007 and 2018.<sup>27</sup> Baseline monitoring was executed sequentially, in each of four distinct coastal regions: Central Coast (2007–2012), North Central Coast (2010–2015) South Coast (2012–2017) and North Coast (2013–2018). The MPA Monitoring Enterprise, a project of the California Ocean Science Trust (OST),<sup>28</sup> developed baseline monitoring plans that were largely implemented through a partnership between the Ocean Protection Council (OPC), OST, California Department of Fish and Wildlife (CDFW) and California Sea Grant. These efforts took a broad approach to soliciting monitoring projects and allowed different groups to experiment with varied methods of data collection, while leveraging funding and resources from partner agencies, collaborative research, community-based science and Indigenous Traditional Knowledge. The results have allowed California to establish a benchmark against which MPA effectiveness can be evaluated over time and given the state a better understanding of the many oceanographic changes that have occurred over the last decade. According to management documents, baseline monitoring has provided California with "an unprecedented understanding of ecological and socioeconomic conditions along the entire California coast."<sup>29</sup>

Between 2012 and 2015, CDFW partnered with OST to develop a statewide MPA monitoring framework to further guide baseline

<sup>24</sup> California Fish and Game Code Section 2853.

<sup>25</sup> *Id.* at Section 2853(c)3.

<sup>26</sup> <http://www.opc.ca.gov/programs-summary/marine-protected-areas/research-and-monitoring/regional-baseline-monitoring/>, accessed June 29, 2019.

<sup>27</sup> <https://www.wildlife.ca.gov/Conservation/Marine/MPAs/management/monitoring#537132130-baseline-monitoring-reports-by-region>, accessed June 18, 2019.

<sup>28</sup> The OST is a non-profit organization that was established in 2000 by the California Ocean Resources Stewardship Act in order to fund scientific research that "help[s] fulfill the missions of the state's ocean resources management agencies" and to "promote more effective coordination of California ocean resource science." CA Public Resources Code Section 36990(b)2 and (b)6.

<sup>29</sup> California Department of Fish and Wildlife, California Marine Life Protection Act Master Plan for Marine Protected Areas at 47 (2018). Available at: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=112486&inline>.

monitoring efforts and provide the foundation for regional long-term monitoring plans. In 2018, CDFW and OPC adopted a more targeted Statewide MPA Monitoring Program Action Plan (Action Plan)<sup>30</sup> that pinpoints focused indicators, objectives and methods to direct long-term, post-baseline monitoring efforts. The Action Plan identifies priority metrics, sites and species for evaluating the effectiveness of the MPA network as a whole, as well as opportunities to use MPA data to help inform management related to other California ocean priorities, including fisheries and climate change. In all, the state is investing \$17 million<sup>31</sup> in long-term MPA monitoring between 2018 and 2021 and the information gathered and analyzed will support a management review of California's MPA network in 2022.

## 2.1. Initial findings from baseline and early monitoring

Given the life history characteristics and natural variability associated with many California marine species, it may take years or even decades to accurately understand regional trends and measure changes that may be attributable to state MPAs. For example, some scientists predict it could take a decade or more to detect increases in rockfish biomass and abundance in California MPAs.<sup>32</sup> However, data from the baseline monitoring program and other sources, particularly data from older MPAs established many years before implementation of the MLPA, offer encouraging results.

### 2.1.1. Fish and wildlife are responding positively

Generally, baseline monitoring results show that California's MPAs are "on track" and that some species are already responding to protection.<sup>33</sup> This is especially true in older MPAs that pre-date the MLPA planning process.

For example, mature fish including cabezon (*Scorpaenichthys marmoratus*), lingcod (*Ophiodon elongatus*) and black rockfish (*Sebastes melanops*) are more abundant in some Central Coast protected areas than in similar fished habitats, according to five-year findings.<sup>34</sup> The endangered black abalone (*Haliotis cracherodii*)—which has not been harvested legally since 1993—increased in size inside Central Coast protected areas during the same time period.<sup>35</sup> The North Central Coast baseline monitoring results show increased abundance of lingcod and several species of rockfish inside MPAs after five years.<sup>36</sup> Additionally, red abalone (*Haliotis rufescens*) populations in the North Central Coast's Sea Lion Cove SMCA, which was designed to curb poaching and protect abalone, experienced a "sharp increase" in the first five years after the MPA was established in 2010.<sup>37,38</sup>

<sup>30</sup> California Department of Fish and Wildlife and California Ocean Protection Council, *Marine Protected Area Monitoring Action Plan* (2018). Available at: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=161748&inline>.

<sup>31</sup> The Ocean Protection Council has authorized \$9.5 million to support the MPA Monitoring Program, in addition to \$2.5 million/year between 2018 and 2022.

<sup>32</sup> Katherine A. Kaplan et al., *Setting Expected Timelines of Fished Population Recovery for the Adaptive Management of a Marine Protected Area Network*, Ecological Applications, 0(0), e01949 (2019).

<sup>33</sup> California Ocean Science Trust et al., *State of the California Central Coast: Results from Baseline Monitoring of Marine Protected Areas 2007–2012* (2013).

<sup>34</sup> *Id.*

<sup>35</sup> *Id.*

<sup>36</sup> California Ocean Science Trust et al., *State of the California North Central Coast: A Summary of the Marine Protected Area Monitoring Program 2010–2015* (2016). Available at: [https://data.cnra.ca.gov/dataset/north-central-coast-state-of-the-region-report\\_all-habitats\\_2010-2015/resource/953d0edd-7d41-4558-9bb6-3242eb3cec93](https://data.cnra.ca.gov/dataset/north-central-coast-state-of-the-region-report_all-habitats_2010-2015/resource/953d0edd-7d41-4558-9bb6-3242eb3cec93).

<sup>37</sup> *Id.*

<sup>38</sup> Since this time, warm water oceanographic conditions, declining kelp forest coverage, and a statewide sea star die-off have led to declining abalone populations throughout their range. In 2017 the California Fish and Game Commission closed the recreational red abalone fishery and in 2018 it extended

A network of 10 marine reserves were established in state waters at the Northern Channel Islands in 2003, through a separate stakeholder process, then fully integrated into the South Coast MPAs, which were implemented in January 2012. Across the Northern Channel Islands reserve network, targeted fish species had 1.5x density and 1.8x biomass inside reserve boundaries after five years post-MPA implementation.<sup>39</sup> In 2015, scientists found that biomass of targeted fish "increased consistently inside all MPAs in the network, with an effect of geography on the strength of response."<sup>40</sup> Additionally, average size of kelp bass (*Paralabrax clathratus*) and California sheephead (*Semicossyphus pulcher*) is "significantly larger" inside most Northern Channel Islands marine reserves.<sup>41</sup> In fact, biomass for targeted fish increased both inside and outside these MPAs, but to a much greater degree inside reserve boundaries, where average biomass for targeted fish species inside Northern Channel Islands reserves increased by 52% between 2008 and 2013 and increased 23% outside MPA boundaries during the same period.<sup>42</sup> Additionally, abundance of three of the five targeted invertebrate species at the Northern Channel Islands, including California spiny lobster (*Panulirus interruptus*), warty sea cucumber (*Parastichopus parvimensis*), and red sea urchin is higher inside these same older MPAs.<sup>43</sup>

### 2.1.2. There is evidence of spillover from MPAs

A 2015 baseline study at the San Diego-Scipps Coastal SMCA and Matlahuayl SMR used DNA barcoding and modeling to look at larval dispersal inside and outside local MPAs.<sup>44</sup> They determined that, although many fish eggs are likely "retained within MPA boundaries, there is also significant spillover into nearby areas outside the MPA."<sup>45</sup> And moreover, "[I]ocal spawning indicates that these MPAs serve as potentially important sources of recruits for a significant portion of resident species."<sup>46</sup>

In addition, a 2019 study of kelp rockfish (*Sebastes atrovirens*) larval dispersal in Carmel Bay and Monterey Bay revealed connectivity between populations of kelp rockfish in several Central Coast MPAs.<sup>47</sup> The study found evidence of connectivity between populations in protected MPA areas and in fished populations. The researchers' observations confirm the "spillover effect ... whereby reproduction within reserves replenishes fished populations ..." and emphasizes the importance of properly designed MPA networks.<sup>48</sup>

### 2.1.3. Older MPAs achieve high performance

In addition to those at the Northern Channel Islands, many other MPAs were created in California state waters prior to implementation of the MLPA, with some dating back several decades. Several of these

(footnote continued)

the closure to 2021.

<sup>39</sup> Scott L. Hamilton et al., *Incorporating Biogeography into Evaluations of the Channel Islands Marine Reserve Network*. Proceedings of the National Academy of Sciences USA 107:18272–18277.

<sup>40</sup> Jennifer E. Caselle et al., *Recovery Trajectories of Kelp Forest Animals are Rapid Yet Spatially Variable Across a Network of Temperate Marine Protected Areas*. Scientific Reports 5:14102 (2015).

<sup>41</sup> Daniel J. Pondella et al., *South Coast Baseline Program Final Report: Kelp and Shallow Rock Ecosystems* (2015) at 49. Available at: [https://caseagrant.ucsd.edu/sites/default/files/SCMPA-27-Final-Report\\_0.pdf](https://caseagrant.ucsd.edu/sites/default/files/SCMPA-27-Final-Report_0.pdf).

<sup>42</sup> *Id.* at 55.

<sup>43</sup> *Id.* at 59.

<sup>44</sup> Alice E. Harada et al., *Monitoring Spawning Activity in a Southern California Marine Protected Area Using Molecular Identification of Fish Eggs*, PLoS ONE 10(8): e0134647. <https://doi.org/10.1371/journal.pone.0134647> (2015).

<sup>45</sup> *Id.*

<sup>46</sup> *Id.*

<sup>47</sup> Diana S. Baetscher et al., *Dispersal of a nearshore marine fish connects marine reserves and adjacent fished areas along an open coast*, Molecular Ecology 1–13 (2019).

<sup>48</sup> *Id.*

more successful MPAs—including no-take areas at Point Lobos and Point Cabrillo—were integrated into the new statewide network during the MLPA design and adoption process.<sup>49</sup> Monitoring in California MPAs with the longest history of protection shows that, over time, fish biomass of several economically important species targeted by fishermen continues to increase inside the MPAs at a greater rate than outside MPA boundaries.

For example, 2012 monitoring results from Point Lobos SMR, which was originally protected in 1973,<sup>50</sup> show that economically important fishes including lingcod, copper rockfish (*Sebastes caurinus*), and vermilion rockfish (*Sebastes miniatus*) are larger and found in higher numbers inside MPA boundaries than in neighboring reefs.<sup>51</sup> Data collected from 2014 to 2016 at Point Cabrillo SMR, which was first protected in 1975, show a doubling of “[b]iomass and abundance of targeted fish species in kelp and shallow rock ecosystems,” when compared with surrounding areas.<sup>52</sup> The monitoring data for these older MPAs confirms that protected areas along the temperate California coast are successful as ecological engines and may herald the future for the full MPA network. In studying Point Lobos SMR and other Central Coast MPAs, Starr et al. posited in 2015 that he would expect similarly positive reserve effects in other parts of central California in future years.<sup>53</sup> Similarly, at the Northern Channel Islands, Kaplan, et al. predicted in 2019 a “three-fold increase in [blue rockfish (*Sebastes mystinus*)] biomass 21 yrs after MPA implementation, while vermilion rockfish is projected to increase nearly four-fold in 31 years.”<sup>54</sup>

The positive effects of older MPAs can also extend beyond enhanced fisheries. A 2018 study of an MPA at the Northern Channel Islands that has been closed since 1978 found that competitive pressure from abundant, native algae in this older reserve likely reduces the success of the invasive alga, *Sargassum horneri*.<sup>55</sup> The authors suggest that older temperate MPAs, in addition to recovering top predators and restoring native algal communities, may also support “stable benthic communities that are resistant to [algal] invasion.”<sup>56</sup>

#### 2.1.4. Commercial and recreational fisheries remain profitable

The profitability of commercial and recreational fishing in California depends on many factors, including fuel prices, international markets, weather, and oceanographic conditions. During the MLPA planning phase, some fishermen expressed concerns about potential impacts to commercial and recreational fish landings if fishing effort were redirected outside MPA boundaries. However, empirical data examining pre and post-MPA boat distribution at the Northern Channel Islands show a broad diversity of responses to MPA establishment, suggesting there are multiple complex factors that impact fishing behavior.<sup>57</sup> There have been some shifts in local fishing patterns following

<sup>49</sup> Point Lobos and Point Cabrillo were also expanded during the MLPA planning process.

<sup>50</sup> <https://www.pointlobos.org/learn-more/point-lobos-history>, June 18, 2019.

<sup>51</sup> California Ocean Science Trust et al., *State of the California Central Coast: Results from Baseline Monitoring of Marine Protected Areas 2007–2012* (2013) at page 36.

<sup>52</sup> California Department of Fish and Wildlife et al., *State of the California North Coast: Summary of Findings from Baseline Monitoring of Marine Protected Areas 2013–2017* (2017) at page 2.

<sup>53</sup> Richard M. Starr et al., *Variation in Responses of Fishes across Multiple Reserves within a Network of Marine Protected Areas in Temperate Waters*, 10(3) *PLoS One* (2015) doi: [10.1371/journal.pone.0118502](https://doi.org/10.1371/journal.pone.0118502).

<sup>54</sup> Katherine A. Kaplan et al., *Setting Expected Timelines of Fished Population Recovery for the Adaptive Management of a Marine Protected Area Network*, *Ecological Applications*, 0(0), e01949 (2019).

<sup>55</sup> Jennifer E. Caselle et al., *Marine management affects the invasion success of a nonnative species in a temperate reef system in California, USA*, 21 *Ecology Letters* 43–53 (2018).

<sup>56</sup> *Id.*

<sup>57</sup> Reniel B. Cabral et al., *Drivers of Redistribution of Fishing and Non-Fishing*

adoption of MPAs and some commercial and recreational fishermen anecdotally report negative impacts to fishing. However, CDFW data suggest that—overall—regional and statewide fishery landings and values do not appear to be negatively impacted by MPAs.

For example, average individual revenues for Central Coast commercial fishermen increased in the five years following that region's MPA establishment in 2007.<sup>58</sup> And according to CDFW, total annual commercial landings value<sup>59</sup> within the Central Coast have remained stable or continued to increase since MPAs were implemented. In 2007, the combined value of commercial landings in Morro Bay and Monterey was \$10.6 million.<sup>60,61</sup> By 2011 that value had increased to \$23.4 million.<sup>62</sup> CDFW's 2017 data—the most recent available—reports a \$22.1 million combined commercial landings value for these ports within the Central Coast MPA region.<sup>63</sup> In addition, some Central Coast recreational charter boat operators have reported benefits to their business from protected areas, through an increase in whale watching excursions, recreational diving and research charters.<sup>64</sup>

In the South Coast, researchers analyzed data from before and after MPA establishment and found no substantial change in total catch and catch per unit effort (CPUE) for California spiny lobster.<sup>65</sup> Although this research found that some fishermen have been displaced from their historic fishing grounds, the bight-wide level of spiny lobster catch and effort for 2015 “[did] not appear to be significantly different than in previous seasons.”<sup>66</sup>

Similarly, in the North Coast, the number of fishermen making more than \$75,000/year between 2008 and 2014 increased. Although this upward trend began before the North Coast MPAs were established in 2012, it continued after MPA designation.<sup>67</sup> A 2014 survey of North Coast commercial fishermen asked whether there was a change in their personal fishing income between 2009 and 2013, correlating with establishment of that region's MPAs in 2012. Eighty-six percent of North

(footnote continued)

Effort After the Implementation of a Marine Protected Area Network, 27(2) *Ecological Applications* 416 (2017).

<sup>58</sup> California Ocean Science Trust et al., *State of the California Central Coast: Results from Baseline Monitoring of Marine Protected Areas 2007–2012* (2013) at page 15.

<sup>59</sup> This is the price paid to fishermen.

<sup>60</sup> California Department of Fish and Game, *Final California Commercial Landings for 2007 – Table 15 Poundage And Value Of Landings Of Commercial Fish Into California By Area*. Available at: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=31700&inline>.

<sup>61</sup> The authors did not include Santa Barbara commercial landings value in the Central Coast MPA region commercial landings value because the Santa Barbara area includes MPAs in both the Central Coast and South Coast MPA regions, and the data reported by CDFW is not discrete enough to appropriately allocate landings values for Santa Barbara between the two MPA regions.

<sup>62</sup> California Department of Fish and Game, *Final California Commercial Landings for 2011 – Table 15 Poundage And Value Of Landings Of Commercial Fish Into California By Area*. Available at: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=57116&inline>.

<sup>63</sup> California Department of Fish and Wildlife, *Final California Commercial Landings for 2017 – Table 15 Poundage And Value Of Landings Of Commercial Fish Into California By Area*. Available at: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=159560&inline>.

<sup>64</sup> Ecotrust. *Establishing Baseline and Assessing Spatial and Socioeconomic Change in the California Central Coast Commercial and CPFV Fisheries*. Technical Report to the MPA Monitoring Enterprise, California Ocean Science Trust. July 13, 2012. Page 180.

<sup>65</sup> Kevin A. Hovel et al., *Final Report: Baseline Characterization of California Spiny Lobster in South Coast Marine Protected Areas*, 2015 at page 13. Available at: <https://casegrant.ucsd.edu/sites/default/files/SCMPA-25-Final-Report.pdf>.

<sup>66</sup> *Id.*

<sup>67</sup> Dr. Steven Hackett, *Socioeconomics of North Coast Fisheries in the Context of Marine Protected Area Formation*. Report to the California Sea Grant College Program (2017) at page 277.

Coast fishermen surveyed said there had been no change or that their income was higher.<sup>68</sup> When North Coast Commercial Passenger Fishing Vessel (CPFV) operators were surveyed on the same question in 2014, 78% said there had been no change or that their income was higher after MPAs were established.<sup>69</sup>

## 2.2. A partnership-based approach to baseline monitoring

The statewide baseline characterization included a combination of both conventional and innovative methods of data collection. The primary focus of the program was to create a comprehensive snapshot of ocean health in the state's MPAs, based on monitoring key habitats. Baseline monitoring integrated existing data collection efforts by federal and state agencies and academic institutions. It also incorporated many new scientific projects, including: surveys of rocky intertidal, sandy beach, and kelp forest habitats; characterization of nearshore foraging seabirds; and use of remotely operated vehicles and crewed submersibles to survey deeper water fish and macroinvertebrates. Additionally, MPA baseline monitoring featured socioeconomic surveys of commercial and recreational human use. Finally, California funded and initiated several innovative approaches to data collection that cultivated new partnerships with local fishermen, California Tribes and Tribal Governments, community members, recreational ocean users, and students.

### 2.2.1. User and community engagement in MPA monitoring

California's approach to baseline monitoring engaged more than 70 partners across the state.<sup>70</sup> In addition to projects executed by academic researchers, the state also incorporated data from volunteer anglers, citizen science and human use projects. Although there can be limitations to the kind and quality of data that are collected by these means, these efforts tangibly involve local communities<sup>71</sup> in MPA management and significantly leverage state investments, resulting in much broader geographic and temporal coverage of MPA monitoring.

For example, between 2010 and 2015, the Long-term Monitoring Program and Experiential Training for Students (LiMPETS) program engaged 3300 kindergarten through 12th grade students from 60 schools to survey rocky intertidal and sandy beach habitat for the North Central Coast baseline monitoring program.<sup>72</sup> The California Collaborative Fisheries Research Program partners local charter boat captains, scientists and recreational anglers to catch, release, and tag fish inside and outside of MPAs. In 2018 this program sampled 15 sites over 84 trips throughout the state of California.<sup>73</sup> Reef Check California relies on hundreds of volunteer SCUBA divers to conduct rocky reef and kelp forest surveys at 75 primary sites throughout California to monitor key fish, invertebrates and algae indicator species.<sup>74</sup> The Beach Watch shoreline monitoring program uses community members to survey beaches within the Greater Farallones and Monterey Bay national marine sanctuaries and tracks information on marine mammals, birds,

<sup>68</sup> *Id.* at page 57, says 66% no change, 10% somewhat higher, 10% significantly higher.

<sup>69</sup> *Id.* at page 78, says 43% no change, 14% somewhat higher, 21% significantly higher.

<sup>70</sup> California Department of Fish and Wildlife, *California Marine Life Protection Act Master Plan for Marine Protected Areas* (August 2016) at 45.

<sup>71</sup> Duncan C. McKinley et al., *Citizen science can improve conservation science, natural resource management, and environmental protection*, 208 *Biological Conservation* 15 (2017).

<sup>72</sup> California Ocean Science Trust et al., *State of the California North Central Coast: A Summary of the Marine Protected Area Monitoring Program 2010–2015* (2015) at 16.

<sup>73</sup> <https://www.mlml.calstate.edu/ccfrp/2018-overview/>, accessed June 18, 2019.

<sup>74</sup> Jan Freiwald and Megan Wehrenberg, *Reef Check California, North Central Coast Baseline Surveys of Shallow Rocky Reef Ecosystems* (2013) at 12.

and human uses. And the California spiny lobster project pairs academic researchers with fishermen to tag lobsters and estimate abundance and movement inside and outside of South Coast MPAs.

Launched in 2007, California's MPA Watch program uses community volunteers to document patterns of human use both within selected MPAs and in control areas. Data are collected from shore (and in some locations by vessel) at predetermined transects. As of 2019, more than 2000 trained volunteers have observed and collected information on consumptive and non-consumptive human use in and around 60 state MPAs, using standardized statewide protocols adopted by partnering organizations.<sup>75</sup> Since 2007, these volunteers have submitted more than 25,512<sup>76</sup> onshore and offshore surveys. In addition to documenting uses within California's MPAs, surveys can help identify poaching "hotspots" that may warrant additional attention from law enforcement. For example, information collected from LA Waterkeeper's boat-based surveys between 2012 and 2016 documented "over 200 potential MPA violations, including 107 recreational boat fishing violations, [one] instance of an active commercial fishing violation, and over 100 instances of illegal onshore fishing."<sup>77</sup> These data are communicated to CDFW and local management agencies to support MPA enforcement.

### 2.2.2. Case study: tribal engagement in baseline monitoring

The MLPA design process advanced Tribe-state relationships and elevated the formal role of California Tribes and Tribal Governments in myriad natural resource policy venues.<sup>78</sup> One specific outcome of that progression is the important contribution Tribes made to MPA baseline monitoring.

Between 2014 and 2017, the Tolowa Dee Ni' Nation led a baseline characterization project in the North Coast that was the first state-funded marine research project in California that incorporated Indigenous Traditional Knowledge. In partnership with several other northern coastal Tribes and Tribal communities, this project studied five culturally and ecologically important keystone species within the beach, intertidal, kelp and mid-depth rock ecosystems. Tribes carried out "an extensive review of archival ethnographies" and "interviews from citizens of local, federally-recognized Tribes who are culturally knowledgeable and are active harvesters" of coastal and marine species.<sup>79</sup> Tribal engagement in the North Coast MPA baseline characterization effort provided valuable scientific, historical and cultural information to the state of California.

## 2.3. MPA monitoring results provide context for broader oceanographic changes

MPA baseline monitoring occurred during several large-scale shifts and regional oceanographic events, including an unusually long and warm ocean heat wave (2012), strong upwelling indices (2012, 2013 and 2014), "anomalously" warm surface waters (2014 and 2015), and a strong El Niño event (2015).<sup>80</sup> Additionally, a harmful algal bloom and persistent abalone die-off occurred in 2011 along the Sonoma Coast, while a mass West Coast die-off of sea stars that took place in 2013 was

<sup>75</sup> <http://wildcoast.org/what-we-do/oceans>, accessed June 18, 2019.

<sup>76</sup> <http://www.mpawatch.org>, accessed August 6, 2019.

<sup>77</sup> Wildcoast et al., *Baseline Highlights from California's South Coast MPA Watch Program: Monitoring Human Activities Along the California Coast*.

<sup>78</sup> This topic is covered in more detail in Section 2.3.

<sup>79</sup> Tolowa Dee-Ni' Nation et al., *Informing the North Coast MPA Baseline: Traditional Ecological Knowledge of Keystone Marine Species and Ecosystems* (2017). Available at: <https://data.cnra.ca.gov/dataset/tek-keystone-marine-species-and-ecosystems-ca-nc-mpa-baseline-study-2014-2015/resource/78633277-141c-4e02-8eec-83a42a381c83>.

<sup>80</sup> California Ocean Science Trust et al., *State of the California North Central Coast: A Summary of the Marine Protected Area Monitoring Program 2010–2015* (2016).

attributed to an unusual sea star wasting syndrome.<sup>81</sup> Since 2014, there has been a 90% decline in bull kelp along the northern California coast, causing herbivorous species like red abalone and red sea urchin to die in large numbers, due to starvation.<sup>82</sup> In 2015, a harmful algal bloom was accompanied by high domoic acid concentrations, which delayed the opening of the Dungeness crab season throughout the West Coast and cost California commercial fishermen \$48 million in lost sales.<sup>83</sup> Though scientists continue to study these events and research their causes,<sup>84</sup> elevated domoic acid levels have been linked to warming ocean waters and, more broadly, climate change.<sup>85</sup> These broad scale changes in ocean conditions risk confounding the results of MPA monitoring efforts, but also amplify the value of the monitoring occurring inside MPAs.

In many cases, California's MPA data sets are robust and long-standing, especially when compared to non-MPA ocean and coastal data sets.<sup>86</sup> Researchers are able to collect information at MPA sites during critical oceanographic events and compare them against older ecological data. This allows the state to better understand climate change impacts like hypoxia, ocean acidification and sea level rise, as well as their impacts on California's coastal ocean and fisheries. The research occurring inside MPAs is informing an increasingly comprehensive picture of California's overall ocean health.

By conducting research in MPAs, scientists can also isolate and study ocean variables without the complex effects of fishing. This allows researchers to document and better understand the ecological consequences of a variety of natural and human-caused events and oceanographic changes. For example, in 2015, when the Plains All American Refugio Oil Spill released over 100,000 gallons of crude oil onto the South Coast's Refugio State Beach, ongoing research and monitoring begun in 2012 at three nearby MPAs contributed to the federal government's oil spill damage assessment. These data provided the state with important information as it planned for restoration and compensation to the public for lost recreational value and injuries to natural resources.

In 2018, OPC granted funds for a two-year monitoring project between Scripps Institution of Oceanography and the Tolowa Dee Ni' Nation that seeks to build capacity and understanding of the impacts of climate change and sea level rise at three coastal sites, including two state MPAs.<sup>87</sup> The data sets gathered through MPA monitoring here and at other locations will allow state and federal managers and Tribes to better understand catastrophic events, assess their effects, and forecast ecological impacts of ongoing and future oceanographic and human-caused changes.

#### 2.4. Long-term monitoring and statewide management review

Since 2016, OPC has worked with CDFW, California Sea Grant and many partners to implement long-term statewide monitoring. The 2018 Action Plan adopted by CDFW and OPC identifies specific metrics, sites and species for evaluating the effectiveness of the MPA network.<sup>88</sup> This

<sup>81</sup> *Id.*

<sup>82</sup> <https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/>, accessed June 18, 2019.

<sup>83</sup> Governor Edmund G. Brown, Jr. letter to U.S. Dept. of Commerce, dated February 9, 2016.

<sup>84</sup> John Brunson et al. *Biosynthesis of the Neurotoxin Domoic Acid in a Bloom-forming Diatom*, 361 Science 1356 (2018).

<sup>85</sup> S. Morgaine McKibben et al., *Climatic Regulation of the Neurotoxin Domoic Acid*, 114(2) PNAS 239 (2017).

<sup>86</sup> This is due to a variety of factors, including the enhanced research and funding opportunities that can arise with new protected area designations.

<sup>87</sup> <https://dornsife.usc.edu/uscseagrant/opc-sio-smith-tides/>, accessed June 18, 2019.

<sup>88</sup> California Department of Fish and Wildlife and California Ocean Protection Council, *Marine Protected Area Monitoring Action Plan* (2018). Available at:

allows the state to solicit and fund projects that are most likely to yield MPA data that will inform future ocean and coastal management.

The state has committed base funding of \$2.5 million per year from general funds for ongoing implementation of the Action Plan and has dedicated additional funds from resource bonds, as well as funding generated by fees imposed on coastal power plant operations.<sup>89</sup> In May 2019, OPC approved disbursement of \$9.5 million to various academic institutions and research organizations for long-term monitoring projects.<sup>90</sup> In all, OPC has secured \$17 million to support three years of monitoring for the period from 2018 to 2021. With long-term monitoring planning underway and funded for the foreseeable future, the state is well positioned to support a robust long-term monitoring program.

In 2016, the state established a formal 10-year cycle of review for its MPA network, based on the minimum amount of time required to demonstrate measurable change in temperate California waters, where many local marine species are slow growing and late to reproduce.<sup>91</sup> The post-baseline data gathered in the coming years will inform a management review of California's MPA network in 2022.

### 3. Interagency and tribal coordination and partnership

In addition to investing in rigorous scientific monitoring, California has adopted a series of programmatic management plans and established an interagency leadership team for executing the strategies included in those documents. By implementing a management approach focused on coordination and partnerships, California has opened up new interagency communication channels, allowing federal, state and local agencies, Tribes and Tribal Governments, and other partners to work more efficiently together to maintain the state's investment in its MPA network and the species and habitats it protects.

#### 3.1. Clear planning documents and integrated state leadership

In terms of policy, California has a progressive conservation ethic, supported by protective environmental laws and fish and wildlife regulations. In order to enforce these laws and regulations, a complex array of federal, state and local agencies has jurisdiction over varied aspects of coastal and ocean management, including permitting and enforcement authority for a variety of uses that may impact state MPAs directly or indirectly.

Created by the California Ocean Protection Act (COPA) in 2004,<sup>92</sup> the OPC is the state policy lead for MPAs<sup>93</sup> and principal facilitator for ensuring communication and coordination between agencies with jurisdiction over projects that may impact MPAs (summarized in Table 1 below). Though not outlined in the table below, other important agencies and entities include the U.S. Office of National Marine Sanctuaries, the U.S. National Park Service, and California Tribes and Tribal Governments.

In 2014, OPC adopted "The California Collaborative Approach: Marine Protected Areas Partnership Plan" (Partnership Plan), which

(footnote continued)

<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=161748&inline>.

<sup>89</sup> California Ocean Protection Council Staff Recommendations, July 25, 2018. Available at: [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20180725/Item4a\\_MPA\\_MonitoringProgramPhase2\\_FINAL.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180725/Item4a_MPA_MonitoringProgramPhase2_FINAL.pdf).

<sup>90</sup> California Ocean Protection Council Staff Recommendations, May 23, 2019. Available at: [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20190523/Item3a\\_MPA\\_Longterm\\_Monitoring\\_Projects\\_FINAL.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20190523/Item3a_MPA_Longterm_Monitoring_Projects_FINAL.pdf).

<sup>91</sup> California Department of Fish and Wildlife, *California Marine Life Protection Act Master Plan for Marine Protected Areas* (August 2016) at page viii.

<sup>92</sup> California. Legislature. *California Ocean Protection Act*. CA Codes (PRC: 35600–35625). [http://leginfo.legislature.ca.gov/faces/codes\\_displayText.xhtml?lawCode=PRC&division=26.5.&title=&part=&chapter=3.&article=](http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=PRC&division=26.5.&title=&part=&chapter=3.&article=)

<sup>93</sup> Sen. Bill 96, 2013 Reg. Sess. (Cal. 2013).

**Table 1**  
State ocean and coastal agencies and entities.

Agency	Mission	MPA Role
California Fish and Game Commission (FGC)	Ensure “abundant, healthy, and diverse fish and wildlife [thriving] within dynamic ecosystems, managed with public confidence and participation, through actions that are thoughtful, bold, and visionary in an ever-changing environment.” <sup>a</sup>	Designates MPAs and adopts rules and regulations, which determine what type of take, if any, is allowed in MPAs
California Department of Fish and Wildlife (CDFW)	Manages California's fish and wildlife and habitats upon which they depend, for their ecological values and enjoyment by the public <sup>b</sup>	Day-to-day management and enforcement of MPA regulations created by FGC; provides biological data and expertise to inform FGC's decision-making process; <sup>c</sup> including the management review of MPAs; <sup>d</sup> grants scientific collecting permits inside MPAs
Ocean Protection Council (OPC)	Ensures California “maintains healthy, resilient and productive ocean and coastal ecosystems for the benefit of current and future generations” <sup>e</sup>	Oversees development of MPA policy; allocates and disburses state funds for a wide range of MPA projects and programs; and facilitates strategic partnerships and coordination between state and federal agencies with ocean and coastal permitting authority over projects that may impact MPAs
Ocean Science Trust (OST)	Promotes “collaboration and mutual understanding among scientists, citizens, managers and policymakers working” <sup>f</sup>	Helps to design and implement MPA monitoring program
California Coastal Commission (CCC)	Protects and enhances California's coast and ocean for present and future generations <sup>g</sup>	Overlapping jurisdiction with MPA management activities; permits coastal projects, including those inside/near MPAs
State Lands Commission (SLC)	“[M]anages 4 million acres of tide and submerged lands and the beds of navigable rivers, streams, lakes, bays, estuaries, inlets, and straits.” <sup>h</sup>	Overlapping jurisdiction with MPA management activities; leases lands and permits coastal and nearshore projects, including those inside/near MPAs
State Water Resources Control Board (SWRCB)	“[P]reserve[s], enhance[s] and restore[s] the quality of California's water resources ... for the protection of the environment ... for the benefit of present and future generations” <sup>i</sup>	Overlapping jurisdiction with MPA management activities; permits activities related to the state's water resources, including waterways that may be in or near MPAs
California Department of Parks and Recreation (Parks)	Provides for the health, inspiration and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting is most valued natural and cultural resources and creating opportunities for high-quality outdoor recreation <sup>j</sup>	Educates visitors about the importance of MPAs using regulatory and interpretive signage, where “thirty percent of the existing MPA network is directly adjacent to California State Park units” <sup>k</sup>

<sup>a</sup> Fish and Game Commission. *Commission Adopts Revised Mission and Vision Statements, Core Values*, December 14, 2018. Available at: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=163068&inline>.

<sup>b</sup> <https://www.wildlife.ca.gov/Explore>, accessed June 18, 2019.

<sup>c</sup> Cyndi Dawson, *California's MPA Management Program Description and Costs*, [http://www.opc.ca.gov/webmaster/\\_media\\_library/2016/02/MPA\\_Management-Program\\_Budget\\_FINALv4.pdf](http://www.opc.ca.gov/webmaster/_media_library/2016/02/MPA_Management-Program_Budget_FINALv4.pdf), accessed June 18, 2019.

<sup>d</sup> Fish and Game Commission. *About the California Fish and Game Commission*. <https://fgc.ca.gov/About>, accessed June 18, 2019.

<sup>e</sup> Ocean Protection Council. *About the Council*. <http://www.opc.ca.gov/about/> accessed June 18, 2019.

<sup>f</sup> <http://www.oceansciencetrust.org/about-us>, accessed June 18, 2019.

<sup>g</sup> <https://www.coastal.ca.gov/whoweare.html>, accessed June 18, 2019.

<sup>h</sup> Cyndi Dawson, *California's MPA Management Program Description and Costs*, [http://www.opc.ca.gov/webmaster/\\_media\\_library/2016/02/MPA\\_Management-Program\\_Budget\\_FINALv4.pdf](http://www.opc.ca.gov/webmaster/_media_library/2016/02/MPA_Management-Program_Budget_FINALv4.pdf), accessed June 18, 2019.

<sup>i</sup> [https://www.waterboards.ca.gov/about\\_us/](https://www.waterboards.ca.gov/about_us/), accessed June 18, 2019.

<sup>j</sup> [https://www.parks.ca.gov/?page\\_id=91](https://www.parks.ca.gov/?page_id=91), accessed June 18, 2019.

<sup>k</sup> Cyndi Dawson, *California's MPA Management Program Description and Costs*, [http://www.opc.ca.gov/webmaster/\\_media\\_library/2016/02/MPA\\_Management-Program\\_Budget\\_FINALv4.pdf](http://www.opc.ca.gov/webmaster/_media_library/2016/02/MPA_Management-Program_Budget_FINALv4.pdf), accessed June 18, 2019.

outlines an interagency management and governance structure to support MPA management.<sup>94</sup> In addition to laying out a collective approach to MPA management, this document supports the creation of an MPA Statewide Leadership Team (Leadership Team) that was memorialized in 2015 by a formal Memorandum of Understanding (MOU).<sup>95</sup> The Leadership Team is comprised of staff from relevant state and federal agencies, California Tribes and Tribal Governments and NGO partners<sup>96</sup> and has a shared work plan that has been adopted by all

<sup>94</sup> Ocean Protection Council, *The California Collaborative Approach: Marine Protected Areas Partnership Plan* (2014). Available at: [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20141202/Item5-master-final-partnership-plan.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20141202/Item5-master-final-partnership-plan.pdf).

<sup>95</sup> *Memorandum of Understanding for Implementation of the California Marine Life Protection Act* (2015). Available at: [http://www.opc.ca.gov/webmaster/\\_media\\_library/2016/08/151104-FINAL-MPA-implementation-MOU\\_scannedsig.pdf](http://www.opc.ca.gov/webmaster/_media_library/2016/08/151104-FINAL-MPA-implementation-MOU_scannedsig.pdf).

<sup>96</sup> Members of the MPA Statewide Leadership Team, led by the Ocean Protection Council (OPC), include: the Department of Fish and Wildlife (CDFW), CDFW Law Enforcement Division (LED), Fish and Game Commission (FGC), California Coastal Commission (CCC), California State Lands Commission (CCLC), Department of Parks and Recreation (DPR), State Water Resources Control Board (SWRCB), California Ocean Science Trust (OST), MPA Collaborative Network (CN), West Coast Regional Office of National Marine Sanctuaries (ONMS) and four tribal seats (one for each of North Coast, North

parties. This work plan identifies lead organizations and completion dates for various actions and outcomes and includes specific indicators of success.<sup>97</sup>

By following the guidance offered in these documents and meeting quarterly, the Leadership Team now has a regular communication channel for interagency coordination and can more easily scan than horizon for future projects, policies and funding decisions that may affect MPAs. The enhanced communication between sister state and federal agencies also allows OPC to more easily track and account for the cumulative impact of multiple projects and policies on the overall integrity of the MPA network.

In 2016, the OPC and California Fish and Game Commission (FGC) adopted a revised “Master Plan for MPAs,” which lays out the core elements of the state's partnership-based management approach. This Master Plan guides the multifaceted and coordinated work being done by the Leadership Team and ensures that MPA funds are spent in accordance with a comprehensive strategy. Taken together, the Master Plan, Partnership Plan and the Action Plan make up the comprehensive,

(footnote continued)

Central Coast, Central Coast and South Coast).

<sup>97</sup> Marine Protected Area Statewide Leadership Team Work Plan FY 15/16–17/18. Available at: [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20150922/Item5\\_Attach2\\_MPALeadershipTeam\\_Workplan\\_FINALv2.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20150922/Item5_Attach2_MPALeadershipTeam_Workplan_FINALv2.pdf).

multi-pronged California “MPA Management Program.”<sup>98</sup>

### 3.2. Agency actions supporting MPA goals

In adopting the MLPA, the California legislature recognized that impacts to marine life are caused by a variety of fishing and non-fishing activities. The MLPA states that no-take SMRs in particular are to be maintained in an “undisturbed and unpolluted state.”<sup>99</sup> The law requires CDFW to “highlight” potential project impacts that may be inconsistent with the goals of an MPA<sup>100</sup> and “recommend measures to avoid or fully mitigate” these impacts.<sup>101</sup>

However, in many cases a proposed project or source of potential impact may lie outside CDFW’s direct jurisdiction or include resources that are managed by federal or local agencies. In these cases, OPC and CDFW work with partner agencies to properly assess potential impacts to the integrity of the MPA network, and avoid or minimize these impacts. As new and expanded proposals for seismic surveys, beach nourishment, desalination plants, seawalls, renewable energy, and other coastal activities emerge, California agencies have begun to plan and condition projects to better integrate and preserve the intent of MPAs. Moreover, during the past five years, state agencies have taken clear steps to integrate MPAs into their decision-making processes and adopt new policies to support effective management. In some cases, projects with potential adverse impacts on MPAs have been redesigned, relocated or even denied, as demonstrated in the following examples.

#### 3.2.1. State Lands Commission

The Diablo Canyon nuclear power plant is located along the central coast of California and generates energy for more than three million people.<sup>102</sup> In 2011, following the Fukushima disaster,<sup>103</sup> Pacific Gas and Electric proposed a controversial seismic imaging project to assess the geologic stability of the Diablo Canyon power plant, which was sited adjacent to multiple earthquake faults. The project would have involved towing a quarter-mile-wide array of underwater air cannons that would emit 250-dB blasts underwater every 15 seconds, 24 hours a day for several weeks.<sup>104</sup>

Experts and community members raised concerns over the project’s predicted impacts to local marine life, including inside the Point Buchon SMR, and some geologists questioned the necessity of the project, given alternative means of assessing geologic risk at the site. However, as lead agency for the project, State Lands Commission (SLC) concluded that the proposed seismic survey could provide useful information. Ultimately, the California Coastal Commission (CCC) denied the Coastal Development Permit, citing the project’s significant and unavoidable impacts to marine resources, especially marine mammals.<sup>105</sup> CCC’s staff recommendation to deny the permit explicitly mentioned the conflict with Point Buchon SMR’s conservation goals, as

<sup>98</sup> <https://www.wildlife.ca.gov/Conservation/Marine/MPAs/Management>, accessed June 18, 2019.

<sup>99</sup> California. Legislature. *Marine Life Protection Act (MLPA)*, CA Codes (FGC: 2850–2863). At §2852(d). [http://leginfo.legislature.ca.gov/faces/codes\\_displayText.xhtml?lawCode=FGC&division=3.&title=&part=&chapter=10.5.&article=.](http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=FGC&division=3.&title=&part=&chapter=10.5.&article=)

<sup>100</sup> *Id.* at Section 2862.

<sup>101</sup> *Id.*

<sup>102</sup> The Diablo Canyon nuclear power plant is now slated for closure and decommissioning in 2024, for unrelated reasons.

<sup>103</sup> In 2011 a major earthquake off Japan caused a tsunami that disabled the power supply and cooling of multiple Fukushima Daiichi nuclear reactors, causing a nuclear accident.

<sup>104</sup> Pacific Gas and Electric, Central Coastal California Seismic Imaging Project 1.0 Expanded Project Description, Revision No. 9 9-28-2012. Available at: <https://www.coastal.ca.gov/energy/seismic/PGE-Project-Description.pdf>.

<sup>105</sup> Coastal Commission Staff recommendation (Nov 13, 2012). Available at: <https://documents.coastal.ca.gov/reports/2012/11/W13b-11-2012.pdf>.

well as likely impacts to wildlife inside, as determinative factors.<sup>106</sup>

This was the first large, multi-agency project proposed after Central Coast MPAs were established in 2007 that would have had significant impacts on new MPAs and the wildlife therein. Initial communication between permitting agencies was inconsistent, stakeholder engagement was limited, and permitting agencies were still developing their understanding of the purpose of protected areas. However, over the course of project review, agencies collaborated more closely, conservation organizations provided technical expertise to decision-makers, and fishermen, conservationists, and Tribes testified together in support of upholding the MPA and protecting marine wildlife from the project’s impacts. This project provided early evidence that coastal management agencies and communities were taking seriously the state mandate to uphold MPA protections.

For example, SLC now requires authorization or a permit from CDFW for any proposed geophysical surveys that are in or will affect MPAs, as mandated in its “Presurvey Notice Requirements for Permittees to Conduct Geophysical Survey Activities” form.<sup>107</sup>

#### 3.2.2. California Coastal Commission

Section 30230 of the California Coastal Act requires “[s]pecial protection shall be given to areas and species of special biological or economic significance.”<sup>108</sup> To fulfill this mandate, CCC policy requires “an analysis of project alternatives that includes avoiding the activities proposed within an MPA or relocating them outside of the MPA. If avoidance or relocation is not feasible, alternatives that would minimize the proposed activities within an MPA should be considered ...”<sup>109</sup>

On several occasions, the CCC has found that MPAs qualify as areas of special biological significance and therefore require special protection. Interpretation has varied by project, but the CCC has used this language to outright deny proposed activities that would result in significant unavoidable marine resource impacts, including in the above Diablo Canyon example. Alternatively, the CCC may require adverse impact avoidance and mitigation measures, as well as marine habitat restoration.

For example, in 2014 oceanfront property owners put forward the Broad Beach Restoration Project in Malibu, which proposed the import of 600,000 cubic yards of sediment to the site, making it the largest beach nourishment project ever undertaken in southern California.<sup>110</sup> The project would have buried and killed all marine organisms located within intertidal and subtidal footprint of the project, including a portion of the Point Dume SMCA.

By the time the Broad Beach project was proposed, MPA literacy and communication among agencies and NGOs had both developed significantly in the wake of the Diablo Canyon decision. Based on input from CDFW and the public, CCC staff devoted an entire section on MPAs in its recommendation and advised that the Broad Beach applicant redesign the replenishment project to avoid direct impacts to the Point Dume SMCA.<sup>111</sup> While the Broad Beach project has been stalled by a series of lawsuits unrelated to the local MPA, it provides an illustrative example of how enhanced interagency coordination during project review can reduce threats to and enhance protections for wildlife and habitat protected in MPAs.

<sup>106</sup> *Id.*

<sup>107</sup> Exhibit G: California State Lands Commission Presurvey Notice Requirements for Permittees to Conduct Geophysical Survey Activities. Available at: [http://www.slc.ca.gov/Programs/OGPP/OGPP\\_ExG.pdf](http://www.slc.ca.gov/Programs/OGPP/OGPP_ExG.pdf).

<sup>108</sup> California Public Resources Code Division 20, California Coastal Act, Section 30230.

<sup>109</sup> Jack Ainsworth and Alison Dettmer, California Coastal Commission Procedural Guidance Re: Marine Protected Areas, dated February 21, 2017.

<sup>110</sup> California Coastal Commission staff report on Agenda item 8a, Coastal Development Permit 4-15-0390, dated October 9, 2015.

<sup>111</sup> California Coastal Commission staff report on Agenda item 8a, Coastal Development Permit 4-15-0390, dated October 9, 2015 at page 90.



### 3.2.3. State Water Resources Control Board

In 2015, the State Water Resources Control Board (SWRCB) adopted an amendment to its Water Quality Control Plan for the Ocean Waters of California. This amendment demonstrates the weight SWRCB now gives to MPA protections. Specifically, it regulates impacts to MPAs associated with new desalination facilities by requiring that:

[d]ischarges shall be sited at a sufficient distance from a[n] MPA ... so that there are no impacts from the discharges on a[n] MPA ... and so that the salinity within the boundaries of a[n] MPA ... does not exceed natural background salinity. To the extent feasible, intakes shall be sited so as to maximize the distance from a[n] MPA.<sup>112</sup>

Additionally, in 2017, the SWQCB and OPC formally agreed by MOU to direct a major portion of fees generated from coastal power plant operations to support MPA management.<sup>113</sup> Many coastal power plants in California use “once-through cooling” (OTC) technology to cool their turbines. This practice—which draws in billions of gallons of estuarine and coastal water per day—can have significant environmental impacts on marine life. In 2010, SWRCB adopted a policy that requires power plants that use OTC technology to pay fees for “mitigation projects directed toward increases in marine life associated with the [s]tate's [MPAs] in the geographic region of the facility.”<sup>114</sup> Under the 2017 MOU, OPC anticipates up to \$5.4 million per year in OTC funds over the next several years, which will be directed to MPA outreach, education, enforcement and research.<sup>115</sup>

Adoption of the desalination amendment and OTC policy are evidence of strong interagency coordination and California's commitment to funding the MPA Management Program.

### 3.3. Engagement of California Tribes and Tribal Governments in MPAs and statewide policy

There are more than 100 federally-recognized California Tribes and Tribal Communities, as well as dozens of California Tribes and Tribal Governments that have not received federal recognition. Many “continue to regularly harvest marine resources within their ancestral territories and maintain relationships with the coast for ongoing customary uses.”<sup>116</sup> As is the case with many California environmental laws, the MLPA does not specifically mention California Tribes or Tribal Governments or provide guidance on how to address cultural or subsistence harvest in the MPA network design process. This reflects a significant policy and social justice oversight.

During the eight-year effort to design the MPA network, California Tribes and Tribal Governments expressed increasing concern that MPA regulations could impact traditional fishing, harvesting and gathering practices, as well as ceremonial activities. Tribes maintained that their

<sup>112</sup> State Water Resources Control Board. *Draft Amendment to the Water Quality Control Plan for Ocean Water of California Addressing Desalination Facility Intakes, Brine Discharges, and to Incorporate Other Nonsubstantive Changes*. 3 July 2014. [http://www.waterboards.ca.gov/water\\_issues/programs/ocean/desalination/docs/draft\\_desal\\_amend070314.pdf](http://www.waterboards.ca.gov/water_issues/programs/ocean/desalination/docs/draft_desal_amend070314.pdf).

<sup>113</sup> Memorandum of Understanding Between OPC et al. Regarding Acceptance and Use of Interim Mitigation Funds for the Once-Through Cooling Policy (2016). Available at: [http://www.opc.ca.gov/webmaster/\\_media\\_library/2016/10/Compressed\\_Acceptance-Use-of-Interim-Mitigation-Funds-for-the-Once-Through-Coolin.pdf](http://www.opc.ca.gov/webmaster/_media_library/2016/10/Compressed_Acceptance-Use-of-Interim-Mitigation-Funds-for-the-Once-Through-Coolin.pdf).

<sup>114</sup> Statewide Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling (May 4, 2010). Available at: [http://www.waterboards.ca.gov/water\\_issues/programs/ocean/cwa316/docs/cwa316may2010/otcpolicy\\_final050410.pdf](http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/cwa316may2010/otcpolicy_final050410.pdf).

<sup>115</sup> Cyndi Dawson letter to OPC, *Update on OPC's Once-Through Cooling Interim Mitigation Program*, November 1, 2017. Available at: [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20171101/Item6\\_OTC\\_November\\_1\\_FINAL.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20171101/Item6_OTC_November_1_FINAL.pdf).

<sup>116</sup> California Department of Fish and Wildlife, *California Marine Life Protection Act Master Plan for Marine Protected Areas* (August 2016) at page 6.

sovereign status distinguishes them from other stakeholders and sought to have cultural activities exempted from MPA regulations.<sup>117</sup> After considerable controversy and debate during the final phase of the MPA planning effort along the North Coast, the state made a measured decision to support continued traditional, non-commercial Tribal uses in specified North Coast MPAs, while maintaining a core of no-take areas that are protected from all forms of harvest.<sup>118</sup>

This was the first time California provided broad, formal recognition of the unique status of Tribes with respect to natural resources, and it has had a transformative effect on state governance. In 2011, California Governor Edmund G. Brown Jr. codified his commitment to Tribes in Executive Order B-10-11, where he acknowledged the critical role of California Tribes and Tribal Communities, called for government-to-government consultation, and created a Tribal Advisor position within the Office of the Governor.<sup>119</sup> Since that time, the state also created a Tribal Subcommittee of the FGC, appointed the CEO of a prominent tribe to the five-person FGC, and created four dedicated regional Tribal representative seats (and four alternate seats) for its MPA Statewide Leadership Team.<sup>120,121</sup> Finally, in 2018, the FGC amended boundaries at Stewarts Point SMR and SMCA in Sonoma County in response to requests by the federally-recognized Kashia Band of Pomo Indians of the Stewarts Point Rancheria.<sup>122</sup> That same year, FGC authorized ceremonial, cultural and subsistence uses in four Santa Barbara, Ventura and Los Angeles county MPAs, in response to requests submitted by federally-recognized Santa Ynez Band of Chumash Indians.<sup>123</sup>

California's effort to involve Tribes and Tribal communities—who have fished, harvested and gathered along the state's coastline for millennia—in resource management decisions in a meaningful way is ongoing. And the issue of Tribal take within California MPAs is not fully resolved. But it's clear that Tribal engagement in MPA design and management efforts have significantly advanced Tribe-state relations and elevated the formal role of California Tribes and Tribal Communities in myriad ocean and coastal policy venues.

## 4. Public engagement and MPA outreach and education

California agencies and partners invest significant time and resources in public engagement and education, which allows the state to enhance communication between agencies and stakeholders, increase social capital, and promote awareness and understanding of the MPA network and its ocean conservation goals. The philanthropic community, in particular, has distributed millions of additional funds since 2012 in support of a wide range of MPA management activities. RLF, for example, has invested more than \$17 million to enhance MPA enforcement and monitoring programs and create and sustain MPA Watch and the MPA Collaborative Network.<sup>124</sup> It has also supported “extensive statewide outreach and educational materials, including brochures for harbors and marinas, videos, docent trainings, and a range of MPA

<sup>117</sup> For more detail on tribes and North Coast MLPA process, see Curtis G. Berkey, *Emerging Issues in Tribal-State Relations: Leading Lawyers on Analyzing the Economic, Cultural, and Political Trends Affecting Tribal-State Interactions* (2014 edition) at page 135.

<sup>118</sup> CA FGC Staff Summary, Meeting of June 6, 2012.

<sup>119</sup> California Executive Order B-10-11 re: California Native American Tribes (September 19, 2011).

<sup>120</sup> <http://www.opc.ca.gov/programs-summary/marine-protected-areas/partnerships/>, accessed June 18, 2019.

<sup>121</sup> [http://www.opc.ca.gov/webmaster/\\_media\\_library/2019/01/MSLT-tribal-reps-call-for-nominations-FINAL-1.4.19.pdf](http://www.opc.ca.gov/webmaster/_media_library/2019/01/MSLT-tribal-reps-call-for-nominations-FINAL-1.4.19.pdf), accessed June 18, 2019.

<sup>122</sup> CA FGC staff summary for June 20–21, 2018. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=159159&inline>, accessed June 18, 2019.

<sup>123</sup> *Id.*

<sup>124</sup> Ocean Protection Council staff recommendation for May 23, 2019 at page 9. [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20190523/Item3c\\_MPAOutreach\\_Enforcement\\_FINAL\\_v1.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20190523/Item3c_MPAOutreach_Enforcement_FINAL_v1.pdf), accessed June 29, 2019.

education programs” aimed at underserved communities and youth.<sup>125</sup>

#### 4.1. MPA Collaborative Network

One particularly innovative product of California's public engagement efforts is the MPA Collaborative Network (Network) a collective of dozens of organizations and hundreds of members. Modeled after an Orange County project based around local MPAs that pre-dated the MLPA process, members of the Network are now organized at the county level into 14 diverse working groups along the California coastline.

Local Network groups are comprised of agency staff, representatives from conservation and education organizations, scientists, recreational ocean users, local businesses, Tribes and fishermen that meet regularly to provide local input on MPA-related issues and management needs.<sup>126</sup> For example, the San Mateo MPA Collaborative works to improve outreach and better protect popular tide pool habitats of the Montara SMR,<sup>127</sup> the Catalina Island Collaborative is installing offshore MPA boundary markers,<sup>128</sup> and the Del Norte Collaborative is creating an educational harbor kiosk at Crescent City, as well as a Tribal educational curriculum.<sup>129,130</sup>

Within the Network framework, local agencies, NGOs, and Tribes provide valuable assistance to MPA managers. During a two-year period between 2013 and 2015, for example, these non-state members of Orange County's MPA Collaborative provided approximately \$4 million in contributions of, among other things, goods, equipment, volunteer and pro bono services, and monies toward MPA management efforts.<sup>131</sup>

The relationship between California and the Network was formally recognized in a 2017 MOU<sup>132</sup> signed by co-chairs of all 14 MPA Collaboratives and representatives of the MPA Statewide Leadership Team. In addition, the Director of the Network is a member of the MPA Statewide Leadership Team's Working Group.<sup>133</sup> Moreover, the Network and its staff provide “information, structure, support and inter-agency communication”<sup>134</sup> to help local community members effectively partner with the state of California. Additionally, the OPC implemented a small grants program in 2017, disbursing state funds to each of the county-based Network groups to support local MPA outreach and education projects.<sup>135</sup> This partnership-driven approach enhances trust across interests, leverages resources, and supports more open communication with state agencies, thereby improving transparency and good governance practices.

#### 4.2. MPA outreach and education

To support voluntary compliance with MPAs, the state has worked with partners to install hundreds of interpretive and regulatory signs at

<sup>125</sup> *Id.*

<sup>126</sup> <http://www.mpacollaborative.org/about/aboutus/>, accessed June 18, 2019.

<sup>127</sup> <http://www.mpacollaborative.org/sanmateo/>, accessed June 18, 2019.

<sup>128</sup> <http://www.mpacollaborative.org/catalina/>, accessed June 18, 2019.

<sup>129</sup> <http://www.mpacollaborative.org/delnorte/>, accessed June 18, 2019.

<sup>130</sup> <http://www.mpacollaborative.org/blog/smallgrants/>, accessed June 18, 2019.

<sup>131</sup> Kelsey I. Jacobsen et al., *In-kind contributions to Orange County marine protected area management*, 178 *Ocean and Coastal Management* (2019).

<sup>132</sup> Memorandum of Understanding to Advance Management of California's MPA Network (August 2017). Available at: [http://www.opc.ca.gov/webmaster/media\\_library/2018/01/Final\\_MPA\\_CN\\_MOU\\_AllSignatures.pdf](http://www.opc.ca.gov/webmaster/media_library/2018/01/Final_MPA_CN_MOU_AllSignatures.pdf).

<sup>133</sup> Marine Protected Area Statewide Leadership Team Work Plan FY 18/19–20/21. Available at: [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20181025/Item4a\\_Exhibit%20A\\_MSLT-Work-Plan-Design-FINAL\\_10.15.18.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20181025/Item4a_Exhibit%20A_MSLT-Work-Plan-Design-FINAL_10.15.18.pdf).

<sup>134</sup> <http://www.mpacollaborative.org/about/aboutus/>, accessed June 18, 2019.

<sup>135</sup> [http://www.coastal-quest.org/?page\\_id=1071](http://www.coastal-quest.org/?page_id=1071), accessed June 18, 2019.

public access points, marinas and harbors statewide. State agencies partnered with the Office of National Marine Sanctuaries to provide educational materials about MPAs and federal and state jurisdiction.<sup>136</sup> CDFW developed a mobile website that allows fishermen to access MPA information via smartphone<sup>137</sup> and collaborates with nautical mapping partners like Garmin and Navionics to ensure fishermen and ocean users can easily determine their location relative to MPA boundaries.

Agencies, NGOs, and educational institutions develop and distribute a wide range of materials and programs designed to meet the needs of specific audiences. Tens of thousands of waterproof fishing guides, maps and recreational brochures have been distributed at harbors, bait shops and dive shops. Aquaria and education partners create displays, curriculum and coloring books and educate thousands of students about local MPAs. Conservation organizations develop and implement programs to engage under-resourced communities in kayaking, surfing and tide pooling inside MPA boundaries. A Santa Barbara environmental organization has partnered with local dive shops to promote regional MPAs as dive trip destinations and has created dive maps featuring protected areas.<sup>138</sup> Throughout California, MPA Ambassador Programs train hotels, gear shops, visitor bureaus and local recreational businesses, including kayak tour guides, on the goals and rules of local MPAs.<sup>139</sup> Most of the outreach materials that have been developed can be found on an MPA online library hosted by the California Marine Sanctuary Foundation.<sup>140</sup>

Many of the activities described above are supported by philanthropic funds, including sustained investments by RLF and the foundations that supported the MLPA planning process, as well as investments at all scales by new funders. Still other outreach efforts are supported by state grants such as the Whale Tail program, run by the CCC, and the “Explore the Coast” program, sponsored by the California State Coastal Conservancy. In 2018, OPC authorized disbursement of \$1.2 million to the Department of Parks and Recreation (Parks) to administer year-round interpretive and educational opportunities and increase MPA literacy and compliance.<sup>141</sup> In May 2019, OPC authorized disbursement of \$1.5 million to various NGOs to support outreach and education.<sup>142</sup> These state funding avenues further underscore the value and impact of interagency engagement in and support for California MPAs.

## 5. Enforcement

Upon investigating 87 MPAs worldwide, Edgar, et al. identified “well-enforced” as one of the five essential features that is most influential in predicting MPA conservation outcomes.<sup>143</sup> Yet enforcement of any kind, whether for protected areas, fisheries management or hunting seasons and limits, is an ongoing challenge for many natural resource managers around the world. In California, it appears the majority of

<sup>136</sup> Marine Protected Area Statewide Leadership Team Work Plan FY 18/19–20/21. Available at: [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20181025/Item4a\\_Exhibit%20A\\_MSLT-Work-Plan-Design-FINAL\\_10.15.18.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20181025/Item4a_Exhibit%20A_MSLT-Work-Plan-Design-FINAL_10.15.18.pdf).

<sup>137</sup> <http://www.dfg.ca.gov/m/MPA/>, accessed June 18, 2019.

<sup>138</sup> <http://www.sbck.org/current-issues/marine-conservation/marine-protected-areas/>, accessed June 18, 2019.

<sup>139</sup> <http://californiampas.org/wp-content/uploads/2016/07/Business-Ambassador-Lessons-Learned.pdf>, accessed June 18, 2019.

<sup>140</sup> <http://californiampas.org/outreach-toolkit>, accessed June 18, 2019.

<sup>141</sup> California Ocean Protection Council Staff Recommendation July 25, 2018. Available at: [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20180725/Item4b\\_MPA\\_OTC\\_Parks&LEDContracts\\_FINAL.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180725/Item4b_MPA_OTC_Parks&LEDContracts_FINAL.pdf).

<sup>142</sup> California Ocean Protection Council Staff Recommendation May 23, 2019. Available at: [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20190523/Item3c\\_MPAOutreach\\_Enforcement\\_FINAL\\_v1.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20190523/Item3c_MPAOutreach_Enforcement_FINAL_v1.pdf).

<sup>143</sup> Graham J. Edgar et al., *Global Conservation Outcomes Depend on Marine Protected Areas with Five Key Features*, 506 *Nature* 216 (2014).

people comply with MPA regulations. Aerial survey transects conducted in southern California from 2008 to 2015 show that, according to 13,558 vessel observations, there was an overall decrease in fishing inside MPA boundaries following establishment of the MPA network in 2012.<sup>144</sup> But some coastal visitors are not aware of MPA rules and a small minority of users may intentionally violate MPA regulations. One of the explicit goals of the MLPA is to, “ensure California’s MPAs have ... adequate enforcement.”<sup>145</sup> Therefore, in addition to enhanced education and outreach, the state has taken a number of steps in recent years to enhance its ability to enforce against poaching and explore new ways to improve compliance with MPA regulations.

### 5.1. Law enforcement capacity

Primary responsibility for enforcing California’s MPAs lies with CDFW’s Law Enforcement Division (LED), which works in partnership with allied federal, state and local law enforcement agencies. CDFW LED is under-resourced, given the human population, size of the state and the complexity of its wildlife management needs. According to the signed 2019–2020 California budget, CDFW will employ 465 sworn wildlife officers<sup>146</sup> statewide for both terrestrial and marine law enforcement. In addition to diverse inland areas that include 30,000 miles of rivers and streams,<sup>147</sup> these officers are responsible for patrolling a vast 1100-mile coastline that includes 124 MPAs, many of which are in remote areas and offshore islands. With a growing California population of 39,500,000 people, this is about one officer per 85,000 people. By comparison, Texas Parks and Wildlife Department has 500 sworn wildlife officers<sup>148</sup> for 28,000,000 people, or one officer per 56,000 residents. Florida Fish and Wildlife Conservation Commission has 853 sworn wildlife officers<sup>149</sup> for its 21,300,000 residents, with a per capita ratio of one officer per 25,000 residents.

In 2017, California established a CDFW LED Marine Enforcement Division, which includes 45 dedicated marine wildlife officers.<sup>150</sup> This Division enforces regulations and laws related to a wide range of issues, from fisheries management and MPAs, to navigation and pollution, to public health and safety and criminal drug charges.<sup>151</sup> Statewide this Division has six large patrol boats and approximately 20 small vessels for marine enforcement patrols.<sup>152</sup> In spite of this limited capacity, the CDFW LED Marine Enforcement Division reported 24,685 contacts made in 2017 while conducting MPA-related patrols statewide.<sup>153</sup> According to 2017 CDFW data, this included 686 violations that resulted in citations, with an additional 1053 warnings issued.<sup>154</sup> Unfortunately,

<sup>144</sup> Amanda J. Zellmer et al., *Aerial Surveys and Distribution Models Enable Monitoring of Fishing in Marine Protected Areas*, 165 *Ocean and Coastal Management* 298 (2018).

<sup>145</sup> California Fish and Game Code Section 2853.

<sup>146</sup> Personal email communication with Chief David Bess, Deputy Director, CDFW LED, June 29, 2019.

<sup>147</sup> <https://www.wildlife.ca.gov/enforcement/career>, accessed June 29, 2019.

<sup>148</sup> <https://tpwd.texas.gov/about/administration-divisions/law-enforcement>, accessed June 18, 2019.

<sup>149</sup> <https://myfwc.com/about/inside-fwc/le/what-we-do/>, accessed June 18, 2019.

<sup>150</sup> Mac Taylor, *The 2018–2019 Budget: Resources and Environmental Protection* (February 14, 2018) at page 38. Available at: <https://lao.ca.gov/reports/2018/3747/2018-19-resources-analysis-021418.pdf>.

<sup>151</sup> CDFW Staff Summary for April 18–19, 2018. Available at: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=156346&inline>.

<sup>152</sup> Personal email communication with Mike Stefanek, Marine District Chief, CDFW, October 19, 2018.

<sup>153</sup> Personal email communication with Mike Stefanek, Marine District Chief, CDFW, October 19, 2018.

<sup>154</sup> William Craven, staff report to Senate Committee on Natural Resources and Water on AB 2369 (June 4, 2018) at page 3. Can be found at [http://leginfo.ca.gov/faces/billAnalysisClient.xhtml?bill\\_id=201720180AB2369#](http://leginfo.ca.gov/faces/billAnalysisClient.xhtml?bill_id=201720180AB2369#)

these data include all violations that occurred inside an MPA, regardless of whether the offense was MPA-related or not. This lack of fine-scale enforcement data makes it difficult to fully contextualize MPA compliance and underscores the need for better tracking of MPA-related violations. In 2018, OPC authorized disbursement of up to \$3 million to CDFW LED to increase statewide patrols and associated resources for the Marine Enforcement District within MPAs.<sup>155</sup>

### 5.2. Innovation and technology

In 1999, when the MLPA was signed by Governor Gray Davis, the legislature recognized the importance of technology to managing MPAs, explicitly calling for “[r]ecommendations for improving the effectiveness of enforcement practices, including, to the extent practicable, the increased use of advanced technology surveillance systems.”<sup>156</sup> Given constraints on LED staff and vessel capacity, California and its partners now look to technology to enhance enforcement effectiveness and ensure available resources are deployed as efficiently as possible.

CDFW LED is slated to transition to an electronic records management system (RMS) starting in 2019.<sup>157</sup> A longtime priority for law enforcement and for NGOs, RMS allows wildlife officers to capture and share law enforcement data in a centralized system. It also automates certain administrative enforcement functions, making information immediately available to officers in the field, including real-time identification of repeat offenders.

Pilot projects are underway in California to test the potential utility of shore-based radar systems and cameras to monitor vessel use patterns inside and outside of MPAs and identify suspicious behaviors. Technologies that use satellites to track and map MPA use, like vessel monitoring systems (VMS) and automatic identification systems (AIS), are being used in places like the Phoenix Island Protected Area to bolster compliance with MPA regulations.<sup>158</sup> These tools may present useful and complementary compliance strategies for California’s MPA network.

### 5.3. Prosecution and sentencing

State wildlife officers patrol marine and coastal waters and issue warnings or citations to those violating California fishing regulations, as defined by the California Code of Regulations, Title 14 (Natural Resources). If a citation is issued for an infraction, the defendant has the right to a court trial, which may result in a fine. If a citation is for a criminal misdemeanor, the County District Attorney or City Attorney with jurisdiction may prosecute the case before a judge and the defendant has the right to a jury trial. If a case goes to trial and the defendant is found guilty, the judge hearing the case will issue a sentence, which may include fines, jail time and other measures.

Prosecution of state fish and wildlife laws—including MPA regulations—is challenging, given evidentiary issues, workload, competing priorities, and political considerations. Not all District Attorneys and City Attorneys prioritize wildlife crimes, especially when compared to other kinds of violations that may include property damage or violent crimes. In some cases, local governments may not prosecute violations

(footnote continued)

, accessed June 18, 2019.

<sup>155</sup> Tova Handelman, Staff Report to CA OPC, *Once-through Cooling Interim Mitigation Program: Improving Enforcement and Compliance Associated with California’s MPA Network* (July 25, 2018). Available at: [http://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20180725/Item4b\\_MPA\\_OTC\\_Parks&LEDContracts\\_FINAL.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180725/Item4b_MPA_OTC_Parks&LEDContracts_FINAL.pdf).

<sup>156</sup> CA Fish and Game Code Section 2856(a)(2)(J).

<sup>157</sup> <https://cdfwmarine.wordpress.com/2018/02/06/new-data-collection-systems/>, accessed June 18, 2019.

<sup>158</sup> Taylor Witkin et al., *Global Fishing Watch Reveals a Fisheries Management Success in the Phoenix Islands* (2016).

of MPA regulations at all. Similarly, sometimes judges and juries impose very minimal fines in MPAs cases that do go to court. For example, in 2009, an individual convicted of illegally taking undersized spiny lobsters from a no-take marine reserve in San Diego for the third time in fewer than two years, received just three years of probation for this misdemeanor conviction.<sup>159</sup>

Since the creation of its MPA network, California has taken a variety of steps to improve prosecution rates and outcomes, including joint trainings and field trips with CDFW LED and the California District Attorneys Association. California is working to educate and enhance communication between the 14 coastal District Attorneys and multiple City Attorneys who issue MPA cases, largely according to their own protocols. Orange, Santa Barbara, Monterey, San Mateo, and Sonoma counties routinely prosecute MPA poaching cases with increasingly significant penalties and fines and the San Diego City Attorney has levied meaningful penalties in recent cases. These outcomes are often accompanied by press releases and media coverage, which support changes in public perceptions, particularly among consumptive users.

Several recent sentencing outcomes suggests a growing trend towards more rigorous prosecutions of MPA poaching. For example, in 2017, the City of San Diego successfully prosecuted four poachers who took more than 250 mostly undersized spiny lobsters from the South La Jolla SMR. The individual who poached 185 lobsters was fined \$11,250, ordered to forfeit his fishing gear and sell his boat, and was sentenced to serve 120 days in custody.<sup>160</sup> Additionally, he was placed on five years of probation and ordered to stay away from the SMR indefinitely.<sup>161</sup> And in 2018, the FGC ordered a five-year suspension of a commercial passenger fishing vessel (CPFV) license, where the captain was convicted of poaching in Santa Barbara Island SMR and 17 other violations, based on evidence collected by two undercover LED officers.<sup>162</sup> On the whole, successful prosecution has risen, especially since important changes were made to state regulations in 2015.

#### 5.4. Revisions to Fish and Game Code

To ensure that CDFW wildlife officers, prosecuting attorneys and judges have the tools necessary to properly enforce MPA regulations, the California legislature recently passed two separate bills related to charging and sentencing MPA violations.

Signed in 2015, California State Assembly Bill (AB) 298 gives wildlife officers the discretion to cite first time MPA violations by recreational fishermen as infractions.<sup>163</sup> Before passage of AB 298, MPA violations could only be treated as misdemeanors, requiring all cases to go before a District or City Attorney and be prosecuted as a crime. As a result, wildlife officers primarily issued warnings to violators, out of concern that MPA cases wouldn't make it through the full criminal system, which may have led to under-enforcement of California MPA regulations. By empowering wildlife officers with the discretion to write tickets in the field for minor MPA offenses as infractions, AB 298 provides the necessary flexibility that may lead to legal consequences

<sup>159</sup> <http://www.sandiegouniontribune.com/sdut-lobster-poacher-given-probation-3rd-offense-2009jun05-story.html>, accessed June 18, 2019.

<sup>160</sup> <https://timesofsandiego.com/crime/2017/06/15/poachers-get-jail-time-fines-after-taking-more-than-250-lobsters-from-la-jolla-reserve/>, accessed June 18, 2019.

<sup>161</sup> *Id.*

<sup>162</sup> CDFW press release: *Commission Suspends License of Sportfishing Charter Boat Operator for Poaching in Southern California MPAs* (Feb 7, 2018). <https://cdfgnews.wordpress.com/2018/02/07/commission-suspends-license-of-sportfishing-charter-boat-operator-for-poaching-in-southern-california-marine-protected-areas/>, accessed June 18, 2019.

<sup>163</sup> California Assembly Bill 298 (Gonzalez) amends Section 12000 of CA Fish and Game Code. Signed by Governor and filed with Secretary of State on June 30, 2015. [https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=201520160AB298](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB298), accessed June 18, 2019.

for a larger percentage of violations.

Signed in 2018, AB 2369 addresses another enforcement challenge by increasing penalties for commercial fishermen and CPFV operators caught poaching in MPAs.<sup>164</sup> This law was passed to ensure that fines are sufficiently high to deter repeat offenses by charter boat operators—who may stand to make thousands of dollars or more in a single trip—and to make it easier for CDFW to recommend license suspension in commercial poaching cases. The bill had support from District Attorneys, California Tribes and Tribal Communities, recreational fishing interests, and NGOs and passed unanimously in the California legislature.<sup>165</sup>

## 6. Conclusion

As new MPAs are established throughout the world to meet global targets, California's post-designation management efforts provide a valuable and educational case study for local, national, and international MPA managers. Indeed, California created and is managing the United States' first statewide, science-based network of MPAs and is working toward global recognition of this achievement through the International Union for the Conservation of Nature Green List for Protected and Conserved Areas.<sup>166</sup>

The California MPA Management Program emphasizes scientific monitoring, interagency coordination, public education and outreach, and enforcement. As such, the most critical lessons learned relate to these key themes.

### 6.1. Science and monitoring

Though it is too soon to draw conclusions on the full ecological impacts of California's MPAs, scientific monitoring efforts to date show some positive results, especially in older MPAs. Findings suggest that California's MPA design and management efforts have been effective to date, where available data show increased biomass and enhanced resiliency of native species inside MPAs. Outside MPA boundaries, spillover effect is documented and commercial fisheries value is sustained and, in certain cases, growing. Research also indicates that MPAs may play a role in helping scientists and managers understand and contextualize climate change.

In the 12 years since the first regional MPAs were established in the Central Coast in 2007, California has invested \$16 million into the baseline monitoring and characterization of its statewide network of MPAs. The state has committed another \$17 million for long-term monitoring from 2018 to 2022, which allows the state to evaluate MPA success and identify areas for improved management, leading up the network review in 2022. This significant financial investment allows California to track its protected areas and provide robust and accessible ocean and coastal data to a broad suite of decision-makers, California Tribes and Tribal Governments, scientists, managers and fishermen.

While early years of monitoring included varied projects with diverse goals and methods, the 2018 Statewide MPA Monitoring Program Action Plan establishes clear and consistent objectives, indicators and metrics for long-term monitoring, as well as the basic infrastructure to

<sup>164</sup> California Assembly Bill 2369 (Gonzalez Fletcher) amends Sections 7857 and 12000 and adds section 12012.5 to CA Fish and Game Code. Signed by Governor and filed with Secretary of State on August 24, 2018. [https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\\_id=201720180AB2369](https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB2369), accessed June 18, 2019.

<sup>165</sup> William Craven, staff report to Senate Committee on Natural Resources and Water on AB 2369 (June 4, 2018) at page 3. Can be found at [http://leginfo.legislature.ca.gov/faces/billAnalysisClient.xhtml?bill\\_id=201720180AB2369#](http://leginfo.legislature.ca.gov/faces/billAnalysisClient.xhtml?bill_id=201720180AB2369#), accessed June 18, 2019.

<sup>166</sup> <http://www.opc.ca.gov/programs-summary/marine-protected-areas/adding-californias-mpa-network-to-the-iucn-green-list/>, accessed June 18, 2019.

store and consolidate data. More recent monitoring projects include Indigenous Traditional Knowledge, which allow the state to integrate invaluable ocean and coastal information and advance the state's commitment to California Tribes and Tribal Governments.

### 6.2. Interagency coordination and partnership

To ensure that its MPA Management Program is strategic and efficient, California has invested significant financial and staffing resources into developing critical planning documents. These include the MPA Partnership Plan, MPA Master Plan, and Action Plan, which together make up the MPA Management Program. Led by the OPC and broadly implemented by the multi-agency Statewide Leadership Team, management efforts are largely successful. They enhance communication among and between agencies, California Tribes and Tribal communities and local communities.

The MLPA itself did not address Tribal harvest, which represents a serious social justice oversight. However, the subsequent MPA planning and management processes have helped to improve California state governance. While an ongoing effort, California Tribes and Tribal Governments now play a more formal and prominent role in several aspects of ocean and natural resource management.

### 6.3. Public engagement and MPA outreach and education

California state agencies and partners invest significant time and resources in public engagement and education, which allow the state to enhance communication between agencies and stakeholders, increase social capital, and promote awareness and understanding of the MPA network and its ocean conservation goals. By providing a venue for Tribes, local fishermen, conservationists, surfers and others to give input on local MPA management needs, the MPA Collaborative Network fosters a sense of community guardianship over the MPA network. Outreach efforts and the installation of regulatory and interpretive signage support public education and understanding of California's MPAs.

### 6.4. Enforcement

While enforcement challenges are persistent for any wildlife laws, California has taken significant steps to support compliance with MPA

regulations. A new CDFW LED Marine Enforcement Division has 45 dedicated marine wildlife officers and its own patrol boats and small vessels<sup>167</sup> and in 2018 the OPC authorized disbursement of an additional \$3 million to increase statewide patrols. Additionally, California is embracing technology as a way to complement existing enforcement efforts.

The state legislature must be dynamic and nimble in providing wardens and prosecuting attorneys the tools necessary to enforce MPA regulations. California has a duty to improve coordination between the many responsible state and local law enforcement agencies and invest in the education of District Attorneys, City Attorneys and judges, so that the state may levy fines significant enough to deter poaching and other MPA violations. These ongoing efforts, together with continuing work to increase public engagement and education, will not only enhance enforcement outcomes for MPA regulations, but may also increase compliance in the future.

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### Declarations of interest

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ocecoaman.2019.104920>.

<sup>167</sup> Mac Taylor, *The 2018–2019 Budget: Resources and Environmental Protection* (February 14, 2018) at page 38. Available at: <https://lao.ca.gov/reports/2018/3747/2018-19-resources-analysis-021418.pdf>.