



SANTA ROSA
MPA

MARINE REGION 2022 YEAR IN REVIEW



TABLE OF CONTENTS

MESSAGE FROM THE REGIONAL MANAGER	3
2. CALIFORNIA RECREATIONAL FISHERIES SURVEY	4
2.1. Resumption of Regular Sampling	4
2.2. Marine Recreational Information Program	4
3. DATA SYSTEM MODERNIZATION & DATA SHARING	5
3.1. Marine Region Data Systems	5
3.2. Data Quality Improvements	5
3.3. Aerial Surveys	5
4. FISHING GEAR INNOVATION	6
4.1. Whale Safe Fisheries	6
4.2. Risk Assessment and Mitigation Program	6
4.3. Emergency Hoop Net Regulations	6
4.4. Experimental Fishing Permit Program	7
4.5. Drift Gillnet Transition Program	7
5. FISHERY MANAGEMENT PLANS	8
5.1. Pink (Ocean) Shrimp, <i>Pandalus jordani</i>	8
5.2. Market Squid, <i>Doryteuthis opalescens</i> , Fishery Advisory Committee	8
5.3. White Seabass, <i>Atractoscion nobilis</i>	8
6. MARINE PROTECTED AREAS	9
7. OUTREACH	10
7.1. Return to In-Person Outreach Events	10
7.2. MPA Website Revamp	10
7.3. CalCOFI Conference	10



8. VESSEL OPERATIONS	11
8.1. R/V Garibaldi	11
8.2. Other Research Vessel Operations	11
8.3. CalCOFI Cruise	11
9. DIVING SAFETY PROGRAM	12
10. MARINE SPECIES HIGHLIGHTS	13
10.1. Ocean Salmon	13
10.2. Groundfish	14
10.3. Pacific Bluefin Tuna, <i>Thunnus orientalis</i>	15
10.4. Pacific Sardine, <i>Sardinops sagax</i> , Pacific Mackerel, <i>Scomber japonicus</i> , and Northern Anchovy, <i>Engraulis mordax</i>	15
10.5. Barred Sand Bass, <i>Paralabrax nebulifer</i>	15
10.6. Pacific Halibut, <i>Hippoglossus stenolepis</i>	16
10.7. California Halibut, <i>Paralichthys californicus</i>	16
10.8. Grunion, <i>Leuresthes tenuis</i>	17
10.9. Pacific Herring, <i>Clupea pallasii</i>	17
10.10. Kelp and Other Marine Algae	18
11. AQUACULTURE AND HATCHERIES	19
11.1. Ocean Resources Enhancement and Hatchery Program	19
11.2. Marine Aquaculture	19
12. INVASIVE SPECIES AND OFFSHORE WIND ENERGY	20
12.1. Invasive Algae in Newport Bay	20
12.2. Offshore Wind Energy Development	20
13. MARINE REGION PUBLICATIONS IN 2022	20



MESSAGE FROM THE REGIONAL MANAGER

Dr. Craig Shuman

One of the prevailing themes of 2022 was the anticipation, excitement, and, at times, trepidation of a return to “normal.” However, as we returned to pre-COVID-19 Pandemic activities in our personal and professional lives, many of us had an overwhelming feeling of anything but normal. The concept of normal is characterized by that which is typical, routine, or average. In scientific terms, we think about a normal probability distribution where observations are more frequent near the mean than those further away in a symmetrical bell-shaped curve.

Both scientific and non-scientific definitions of “normal” are based around the common theme of predictability – that we can generally expect the future will be similar to our experiences in the past. When there are abrupt changes, like the COVID-19 Pandemic, that predictability is thrown out the window and we experience “abnormal” conditions. What surprised me, however, is how my return to normal has been filled with so much uncertainty - what days will I be in the office, what meetings will I attend in person, will my flight be delayed...again, and how do I manage the flood of in-person commitments and activities that had been largely absent for the past two years?

While I am confident that we will soon adjust to our new post-COVID-19 Pandemic normal, I am less certain whether we will be able to, nor should we, normalize the impacts of our changing climate on California’s marine resources and coastal communities. It seems like every year we experience a new record-breaking or unprecedented condition. 2022 was no exception as we experienced a record heat wave and the conclusion of California’s three driest years on record followed by record-breaking rainfall. In the ocean environment, we entered a very rare “triple-dip” La Niña, which is generally associated with strong upwelling, cooler water, and high ocean productivity. At the same time, we also experienced periods of abnormally warm ocean water that translated into once-in-a-lifetime fishing opportunities for warm water species off northern California, and harmful algal blooms that resulted in the closure of the razor clam fishery in Del Norte County, led to a massive fish die-off in San Francisco Bay, and impacted seals and sea lions in Southern California.

Sustainably managing California’s marine resources is extremely challenging under normal conditions. It becomes exponentially more difficult when we no longer have a consistent baseline or frame of reference to help us reliably predict the status of a species or ecosystem, or the outcome of a management action. Marine Region staff rose to the challenges presented by abnormal conditions in our return to normal. Working with California Tribes, stakeholders, and a variety of partners, we continued to sustainably manage California’s fisheries and marine ecosystems in the face of change and uncertainty.



Lingcod under kelp in Point Lobos SMR - Chad King NOAA MBNMS.



Drone view of the R/V Garibaldi and a sea lion covered buoy during coastal pelagic species (CPS) aerial survey - Trung Nguyen CDFW.

2. CALIFORNIA RECREATIONAL FISHERIES SURVEY

2.1. Resumption of Regular Sampling

California Recreational Fisheries Survey (CRFS) samplers interviewed California's marine recreational anglers at more than 400 sampling sites coastwide in order to accurately estimate catch and effort in a time frame and on a scale that met management needs. 2022 marked the first full year since the COVID-19 Pandemic began that CRFS resumed sampling of all modes using regular sampling protocols. Several thousand assignments were conducted at launch ramps, piers, jetties, beaches, banks, and breakwaters, as well as commercial passenger fishing vessels (CPFVs or "party boats"), both dockside and on board. Data collected included catch, fishing effort, angler demographics, and biological measurements on recreationally caught finfish. When aboard CPFVs, CRFS staff collected additional data on fishing location and returned finfish. Monthly estimates were used by various Department projects, external stock assessors, scientists, other agencies, and the public (via [the Pacific Coast Recreational Fisheries Information Network website](#)). CRFS field staff also provided information and outreach materials to anglers on [species identification](#), [marine protected areas](#), [barotrauma](#) and the [use of descending devices](#).

2.2. Marine Recreational Information Program

Since 2010, California has been exempted from the federal National Saltwater Registry Program that benefits California anglers by eliminating annual federal registration fee requirements. To receive this exemption, the Marine Region conducts CRFS in a scientifically sound manner that meets national standards set by the federal Marine Recreational Information Program (MRIP). Based on MRIP review of a portion of CRFS methods, the Fisheries Analytics Project and CRFS worked to implement suggested improvements to align CRFS methods with MRIP data standards.



Clockwise from top: Copper rockfish being sampled - Aris Ownsbey CDFW. Copper rockfish in the wild - John Ugoretz CDFW. CDFW staff Aris Ownsbey and Andrew Klein extracting otoliths - James Phillips CDFW.

3. DATA SYSTEM MODERNIZATION & DATA SHARING

3.1. Marine Region Data Systems

The Marine Region Data Management Project (DMP) along with the Department's Data Technology Division (DTD) enhanced existing data systems tailored for Marine Region applications. The Marine Landings Data System, the Marine Logs System, [the Marine Species Portal](#), and the Recreational Fishing Regulations Database all received new functionality. The Marine Region's Geographic Information System (GIS) team began developing automated processes to convert CRFS data into useful map products. The Marine Fisheries Data Explorer, which will allow the public to explore reviewed and summarized California commercial landings data, was also developed and should be released in early 2023.

The DMP, DTD and the Ocean Salmon Project (OSP) teamed up to develop new solutions for modernizing the Ocean Salmon Data Project database system to automate the quality control reviews of standard data streams. The new system will allow OSP to house, secure, manage, and access all project data in a modern, cloud-based platform that facilitates data requests and cross-program analyses. Modernizing OSP data will improve data management efficiency, allow greater versatility in data analyses, and increase access to these important data.

3.2. Data Quality Improvements

To ensure the quality of commercial fishing landings data, Marine Region staff perform data quality assurance and quality control (QAQC) reviews on an annual basis. In 2022, we transitioned from annual to quarterly data reviews to focus on recent data, reduce data recalls on older data, and improve communication time frames with fish businesses submitting the data.

The Marine Fisheries Statistical Unit (MFSU) began developing an automated QAQC tool that receives commercial fishing landings data and uses fishery-specific information to identify potential errors and outliers. This tool is expected to be completed in 2023 and will then be expanded to include commercial logbook data.

3.3. Aerial Surveys

In an effort to improve current [coastal pelagic species \(CPS\) surveys](#), Marine Region staff worked with [Oceans Unmanned](#) to begin developing new methods to capture fish school images from unoccupied aerial systems (UAS). Using multispectral and color image sensors, eight survey days were completed. UAS were launched from Department research vessels in Long Beach, Ventura, and Monterey. The project successfully obtained images of fish schools with the multispectral image sensor. Future work will continue to develop these methods and analyze previous survey images. The long-term goal is to use imagery to make the surveys more repeatable using electronic image analyses.

Top to bottom: Aerial drone view of the R/V *Garibaldi* during CPS UAS survey - Trung Nguyen CDFW. Piloting the drone during CPS UAS survey in Ventura - Trung Nguyen CDFW. The DJI m210 drone carrying a multispectral sensor being delivered to the survey location - Trung Nguyen CDFW.



4. FISHING GEAR INNOVATION

4.1. Whale Safe Fisheries

In partnership with the National Marine Sanctuary Foundation and the California Ocean Protection Council, Marine Region staff hosted a gear innovation workshop in August 2022. Building upon prior meetings and development discussions, the workshop brought together nearly 40 participants. Gear manufacturers from locations across North America, agency staff, and commercial trap gear fishermen developed a shared understanding of how new, innovative fishing gears perform and engaged in a discussion of potential barriers and opportunities for their widespread adoption in the Dungeness crab fishery.



4.2. Risk Assessment and Mitigation Program

During the 2021-22 Dungeness crab fishing season, Marine Region staff conducted 13 aerial surveys and nine risk assessments under the Risk Assessment and Mitigation Program (RAMP). In consultation with the Working Group for the commercial Dungeness crab fishery, Director Bonham opened the last fishing zone on December 29, 2021, and the fishery closed statewide on April 20, 2022. Based on surveys late in the year, the fishery was initially opened for recreational crabbers under a trap restriction on November 5, 2022, and for the commercial fishery on December 31st, just in time for the new year. RAMP regulations required fishery participants to submit bi-weekly reports, and more than 2,300 reports were received for 364 individual permits.

4.3. Emergency Hoop Net Regulations

The Fish and Game Commission (Commission) adopted emergency hoop net regulations that went into effect on October 31, 2022. The regulations address concerns regarding increased use of hoop nets in the recreational Dungeness crab fishery when a crab trap restriction is in effect and add consistency to their use statewide while minimizing the risk of marine life entanglements. Prior to adoption, Marine Region staff conducted outreach including a virtual webinar that invited participants in both the recreational crab and lobster fisheries.



Top: Commercial vessel returning to Crescent City Harbor - Christy Juhasz CDFW
Bottom: Invertebrate staff measuring rock crab in Lawson's Landing, Marin County - CDFW. Crab pots in Crescent City - Morgan Ivens-Duran CDFW.

4.4. Experimental Fishing Permit Program

A new Experimental Fishing Permit (EFP) Program started April 1, 2022, based on regulations established by the Commission. The Commission may now authorize the Department to issue EFPs for commercial or recreational marine fishing activities that are otherwise prohibited. The program fosters innovation and experimentation in California's marine fisheries to inform the management, conservation, and sustainable use of the state's marine resources. Marine Region staff served a central role not only in the development of the new regulations, but also the day-to-day administration of the program, including pre-application consultations to help navigate the process, answer questions, and discuss the potential of applications. Staff also reviewed EFP applications and coordinated with Commission staff on permit issuance and oversight.



In 2022, 23 inquiries were received from potential applicants and two EFPs were approved. In August, the Commission approved an EFP for commercial testing of deep-set and night-set buoy gear configurations targeting swordfish and other highly migratory species within state waters. Additionally, an EFP to allow exploratory fishing for deep water crab species in northern California was approved by the Commission in October.

4.5. Drift Gillnet Transition Program

Marine Region staff finalized implementation of the Drift Gillnet (DGN) Transition Program, required by Senate Bill 1017 (2018). Eligible permit holders who filed a declaration of intent to participate by January 1, 2020 had until October 28, 2022 to complete the process. At the conclusion of the program, 38 California DGN permit holders voluntarily relinquished their nets and state permits, agreed to not fish, renew, or transfer a federal permit, and received payment. Of those, 23 were "active" and 15 were "inactive," based on their historical fishing activity. Pursuant to Senate Bill 1017, all remaining California DGN permits must be surrendered or revoked by January 31, 2024. Under federal legislation passed late in 2022, all federal permits will be phased out and DGN will be prohibited by 2027.



Top: Invertebrate staff measuring sea urchins at Van Damme, Mendocino County - CDFW LED. Bottom left: Humpback whale fluke - Alexa Mutti CDFW. Senior Environmental Scientist Ryan Barbling presenting at a Gear Innovation Workshop held in Sausalito with gear manufacturers and crab fishing industry - Christy Juhasz CDFW.

5. FISHERY MANAGEMENT PLANS

5.1. Pink (Ocean) Shrimp, *Pandalus jordani*

On April 20, the Pink Shrimp Fishery Management Plan (FMP) was adopted by the Fish and Game Commission. This FMP represents the first to be adopted as a “basic FMP” under the scaled management approach in the Marine Life Management Act Master Plan (2018), providing for a more streamlined and cost-effective approach for less complex fisheries. The FMP improves management of the fishery by implementing a harvest control rule with catch-based and environmental triggers and requires the use of LED footrope lighting devices to reduce bycatch of federally threatened eulachon. The FMP aligns management of the California fishery with that of Oregon and Washington, which both have Marine Stewardship Council (MSC)-certified sustainable pink shrimp fisheries. With the FMP in place, the pink shrimp industry applied for MSC certification, with a decision to be made in 2023. If approved, the pink shrimp fishery will be the first California state-managed fishery to apply for and receive a certified sustainable rating by the MSC.



5.2. Market Squid, *Doryteuthis opalescens*, Fishery Advisory Committee

In collaboration with the independent facilitator, CONCUR Inc., Marine Region staff initiated a Squid Fishery Advisory Committee (SFAC) process to review California market squid fishery management. The Market Squid Fishery Management Plan (FMP) was developed in response to industry-sponsored legislation in 1997 making it one of California’s oldest FMPs. Stakeholder representatives were appointed to the SFAC in November, and a year-long series of stakeholder meetings will commence in early 2023. Long-term monitoring programs, advancements in assessment tools, and experienced fishery participants now pave the way for a targeted evaluation of the effectiveness of existing management controls. A post-doctoral scholar and an Adjunct Professor in Applied Math from the University of California, Santa Cruz and NOAA Fisheries are working with Marine Region staff to support the effort.

5.3. White Seabass, *Atractoscion nobilis*

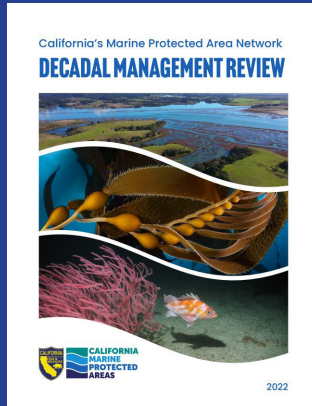
In April, staff met with the White Seabass Scientific and Constituent Advisory Panel (WSSCAP) as part of the annual review of the White Seabass Fishery Management Plan (WSFMP) and its five “points of concern” for the 2020-2021 season. Staff evaluated white seabass commercial landings and recreational catch, sex and length data, information on forage fish availability, and socioeconomic data. The WSSCAP and Department agreed that none of the WSFMP points of concern were met for the season, so no further management action was needed in 2022.

A study to update white seabass size at maturity is continuing. Based on analyses, it was decided additional sampling close to the minimum size limit was needed. An additional 63 samples were collected and analyzed in 2022, bringing the total to 486 white seabass from San Diego to San Francisco assessed for size at maturity. The study is anticipated to be concluded in 2023.



6. MARINE PROTECTED AREAS

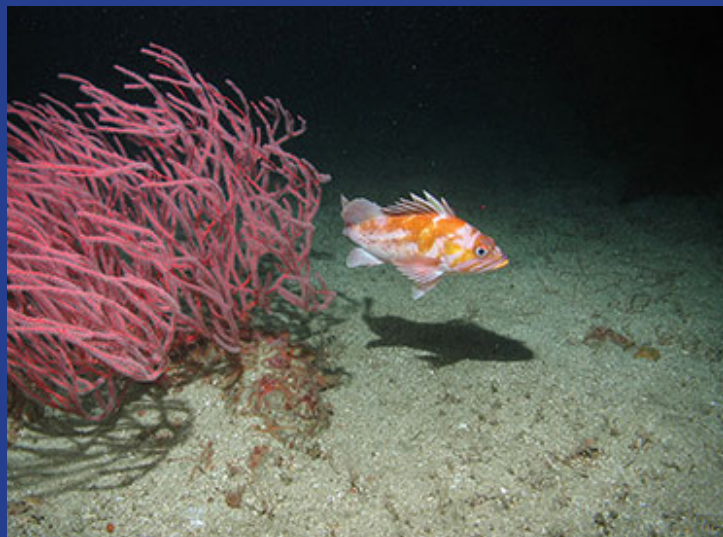
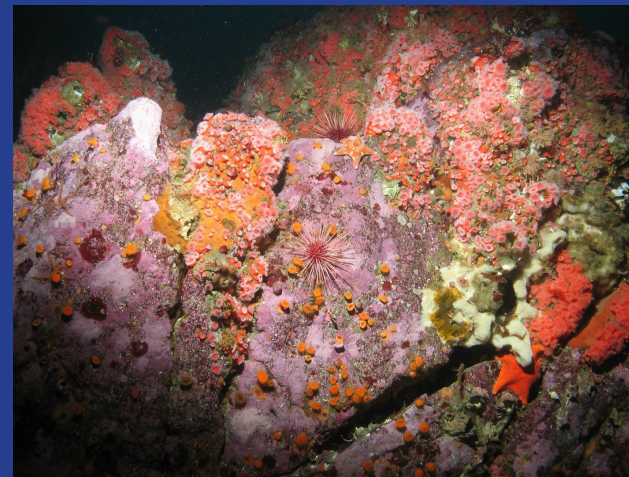
In 2022, the MPA Management Project focused on preparing the first comprehensive MPA Decadal Management Review (Review), released in January 2023. The Review evaluates the MPA Network and Management Program in meeting the goals of the Marine Life Protection Act and includes adaptive management recommendations for Commission consideration.



Several core Program activities and milestones helped inform the Review. The first statewide results from long-term MPA monitoring became available, presented in both detailed technical reports and brief snapshot summaries. In collaboration with the Ocean Protection Council, staff co-hosted an “Ask the Researcher” webinar series to provide the public with a forum to interact with MPA monitoring scientists. Staff coordinated with the Department’s Law Enforcement Division to enter more than 8,000 citations from 2016 to 2021 into a database to track violation patterns.

To ensure partner input was incorporated into the Review, the Department invited tribes, agencies, and organizational partners to submit reports highlighting their MPA management contributions, challenges, and recommendations over the last decade. Twenty-two reports, as well as a comprehensive summary provided by tribes, are available in their entirety as appendices to the full Review.

Top: CDFW diver in Blue Cavern Onshore State Marine Conservation Area (No-Take) holding MPA banner - Amanda Van Diggelen CDFW. Colorful benthos, urchin, and sea stars in Southeast Farallon Island State Marine Reserve - CDFW/MARE. Bottom left: Copper rockfish - CDFW/MARE. MPA Project staff conducting outreach at the international scuba convention in Long Beach - Steve Wertz CDFW.



7. OUTREACH

7.1. Return to In-Person Outreach Events

2022 saw the return of Marine Region staff to a variety of in-person outreach events. Staff participated in an international scuba convention to provide information on MPAs. In July, staff hosted a pop-up tent and table at the Santa Cruz Wharf for the NOAA “Day on the Beach” outreach event for people with disabilities. The event brought out hundreds of participants and visitors. Marine Region staff were on hand to distribute outreach materials and communicate sustainable fishing messages. Also in July, staff participated in the Santa Barbara Channel MPA Collaborative’s Goleta Beach MPA and Subsistence Fishing Community Event, to answer questions about fishing regulations and MPAs. In September, staff returned to Santa Cruz for “Sanctuary Fest,” a NOAA event celebrating 50 years of National Marine Sanctuaries as well as the Monterey Bay National Marine Sanctuary’s 30th anniversary. In October, staff attended the California Seaweed Festival in Tiburon to distribute information regarding kelp and other marine algae harvest, joined State Parks for outreach at the 76th annual Pismo Beach Clam Festival, and hosted a pop-up tent and table at the Santa Barbara Harbor Seafood Festival to engage with a variety of stakeholders, provide regulatory information, and answer questions. In November, staff organized a special topic session on MPA network science and management at the Western Society of Naturalists annual meeting.

7.2. MPA Website Revamp

Throughout 2022, Marine Region staff worked on a complete redesign of the Department’s [Marine Protected Areas \(MPAs\) web pages](#) to make it easier for the public to find relevant MPA information and regulations. The site includes a new MPA home page that features an interactive MPA map, and 97 new individual web pages linked to from the map. Each page details either a single or adjacent group of the state’s 124 MPAs and 14 special closures. This new tool makes it much easier for anyone interested in MPAs to access information based on location.

7.3. CalCOFI Conference

The [California Cooperative Oceanic Fisheries Investigations \(CalCOFI\) conference](#) was held December 5-7 at the Southwest Fisheries Science Center (SWFSC) in La Jolla and hosted by Scripps Institution of Oceanography in association with the Department and SWFSC. The symposium focused on “Innovative techniques and novel applications of time series data to marine resource management”. For the first time, a hybrid format was offered for attendance with 105 in-person registrants and 45 remote participants. The third day consisted of three concurrent workshops with topics including: Southern CA Ocean Biomolecular Observing Network; Incorporating and coordinating pollutant time series into a CA pollutant monitoring program; and Integrating ecosystem observations and recruitment forecasting into fisheries assessment and management.



CDFW Environmental Scientists Danielle Cantrell, Kristen Mattingly, Sara Worden, Morgan Ivens-Duran, and Claudia Makeyev interacting with the public at the Santa Cruz Shared Adventures “Day on the Beach” - Lisa Ullal NOAA. Scientific Aid Jarrett Seiler and Wildlife Officer Joe Johnson conducting outreach at the Santa Barbara Harbor Festival - Alexa Multi CDFW.

8. VESSEL OPERATIONS

8.1. R/V *Garibaldi*

The Research Vessel (R/V) *Garibaldi* was underway 85 days in 2022. This is up from 71 days in 2021 but considerably lower than the vessel's annual average of 120 days at sea in years past. This year's reduced usage was mostly due to unexpected repairs in the middle of the sampling season and poor weather conditions. The *Garibaldi* participated in red abalone and white abalone outplants and their related surveys, trawling studies for California halibut, and diving surveys for barred sand bass. Restrictions to outside partner cruises were lifted in the spring. The *Garibaldi* assisted the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) and Reef Check with diving surveys again this year, for the first time since early 2020.

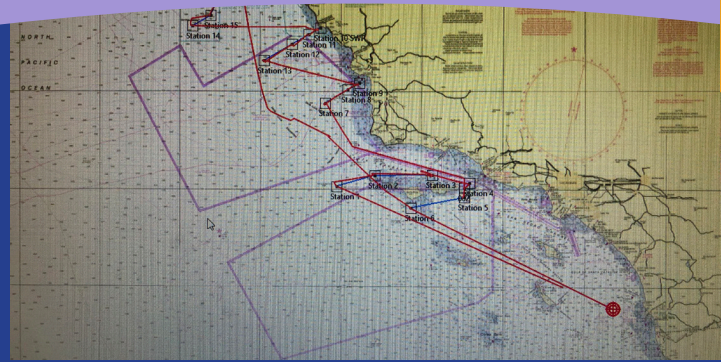
8.2. Other Research Vessel Operations

The Marine Region's fleet includes 14 boats ranging from 12' inflatables to 29' workboats stationed from Eureka to San Diego. In 2022, the vessels operated more than 140 days along California's mainland coast and offshore islands. Research included diving, mid-water trawls, aerial survey support, and more.

8.3. CalCOFI Cruise

In October, the NOAA ship *Reuben Lasker* departed from San Diego for an eight-day Enhanced CalCOFI cruise. The goal of the cruise was to collect eDNA samples, environmental variable data, and marine ecosystem data at 18 new stations around the Channel Islands, Monterey Bay National Marine Sanctuary, the proposed Chumash Heritage National Marine Sanctuary, and the Wind Energy Opportunity Area near Morro Bay. The new stations are intended to be added to future CalCOFI cruises. Two Marine Region staff participated on the scientific crew and assisted with sampling.

Top to bottom: Enhanced CalCOFI Cruise track for the R/V *Reuben Lasker* - Harrison Huang CDFW, Zachary Gold of Scripps Institution of Oceanography/Southwest Fisheries Science Center NOAA/Southern California Coastal Water Research Project and CDFW Environmental Scientists Harrison Huang and Dylan Inskip processing samples in the ship's lab - Rachel Pound Scripps Institution of Oceanography. [Manta net tow](#) - Harrison Huang CDFW. Retrieving water samples from a CTD cast - Zachary Gold SWFSC.



9. DIVING SAFETY PROGRAM

The Department's underwater activity increased following the reduction of COVID-19 Pandemic restrictions. The Diving Safety Program hosted the first eight-day certification course for new diving staff since the COVID-19 Pandemic began, an offering that had been postponed for three years. Regional in-person requalification workshops for each of the Department's 60 active divers also resumed. For the year, Department staff completed 994 working dives for fisheries and conservation research and monitoring, enforcement, and light maintenance tasks. Many of these were collaborative efforts involving one or more of 10 separate scientific diving organizations (agencies, universities, and others) who contributed approximately 48 visiting divers to leverage Department efforts.



CDFW kelp forest surveys in Monterey Bay - Shelby Kawana CDFW.
Diver at the surface - David Osorio CDFW. Bottom: CDFW Senior
Environmental Scientist Laura Rogers-Bennett at work underwater at
Salt Point State Park - Abbey Dias CDFW

10. MARINE SPECIES HIGHLIGHTS

10.1. Ocean Salmon

The annual California Ocean Salmon Information Meeting was held virtually and had the highest ever attendance, surpassing last year's attendance record by more than 50% with 346 attendees. Staff provided information on 2021 ocean salmon fisheries and spawning escapement, the 2022 stock abundance forecasts, and the outlook for 2022 ocean salmon fisheries.

The impacts of the COVID-19 Pandemic continued to create fishery modeling challenges in 2022. Brood year 2019 fall-run Chinook salmon from Trinity River Hatchery were not marked or tagged with coded-wire tags at the normal 25% rate due to travel and physical distancing limitations. Consequently, Trinity River Hatchery-origin age-two fish caught in ocean fisheries and returning to the Klamath River basin in 2021 were indistinguishable from natural-origin fish, and hatchery contributions to this age class could not be estimated using established methods. Members of the Klamath River Technical Team used historical average proportions of natural to hatchery-origin age-two spawners to estimate the number of Trinity River Hatchery age-two fish in the inland fishery and spawning sectors.

The 2021 commercial fishery exceeded expectations, with 202,455 fish landed and valued at \$18.5 million. Before the 2021 season started, fishery modeling projections suggested only

66,298 Chinook would be landed. As a result of this over-performance, the 2022 commercial ocean salmon seasons saw extra constraints to better limit impacts on Endangered Species Act (ESA)-listed California Coastal Chinook. The number of commercial fishing days allowed in 2022 was 88, compared to 99 in 2021. In 2022, the commercial fishery landed 211,186 fish, valued at \$17.1 million.

Staff participated in the development of new harvest control rules (HCRs) to regulate both ocean and inland fisheries impacts on ESA-listed Southern Oregon-Northern California Coast (SONCC) Coho Salmon. The work also required an emergency Pacific Fishery Management Council meeting in January 2022 so the Council could take final action to approve the new harvest control rules, which were published as Amendment 23 to the Pacific Coast Salmon Fishery Management Plan.

Despite staffing shortages, sampling goals were met for the 2022 ocean salmon fisheries. Approximately 15,670 heads were collected from adipose fin-clipped salmon. Based on analysis of the coded-wire tags removed from the heads by Santa Rosa lab staff, the hatchery brood year with the most significant contributions to ocean fisheries were three-year-old Mokelumne River Chinook, similar to prior years.



Top: Chinook salmon for sale - Olivia Boeberitz CDFW. Chinook salmon heads - Olivia Boeberitz CDFW.

10.2. Groundfish

Stock assessments for copper and quillback rockfish species off California completed in 2021 suggested these stocks may be more depleted than previously thought. Marine Region staff collaborated with groundfish industry members to develop fishing seasons and other strategies to conserve these nearshore rockfish species of concern. For both commercial and recreational sectors, actions were taken to increase fishing opportunities for healthy stocks of offshore groundfish species.

Staff continued to support repealing the Cowcod Conservation Area (CCA). To protect important deep-sea corals and sponges once the CCA is repealed, discrete area closures within the CCA were developed. These area closures are a product of collaboration between Marine Region staff, groundfish industry members, law enforcement, and non-governmental organizations.

To increase the amount of data available for future stock assessments, Marine Region staff expanded collection of biological data statewide. While copper and quillback rockfish remain a primary focus of these efforts, staff have collected more than 2,200 samples across 28 different species of rockfish. This data collection effort covers most of California – from Crescent City and Eureka in the north, to Monterey in central California, as well as Santa Barbara, Los Angeles and San Diego in southern California. Staff participated in multiple workshops to develop and incorporate new approaches to inform future groundfish stock assessments including a review of visual-acoustic methods for surveying semi-pelagic rockfish species and applications of hook-and-line survey data.

Rockfishes right top to bottom: Copper, gopher, black-and-yellow, china, vermilion, and (top left) black rockfish - Dave Stafford NOAA. The CDFW Groundfish Management and Innovation Project: T. Larinto, J. Budrick, M. Parker, A. Klein, M. Yaremko, C. McKnight, M. Mandrup, J. Phillips - CDFW.

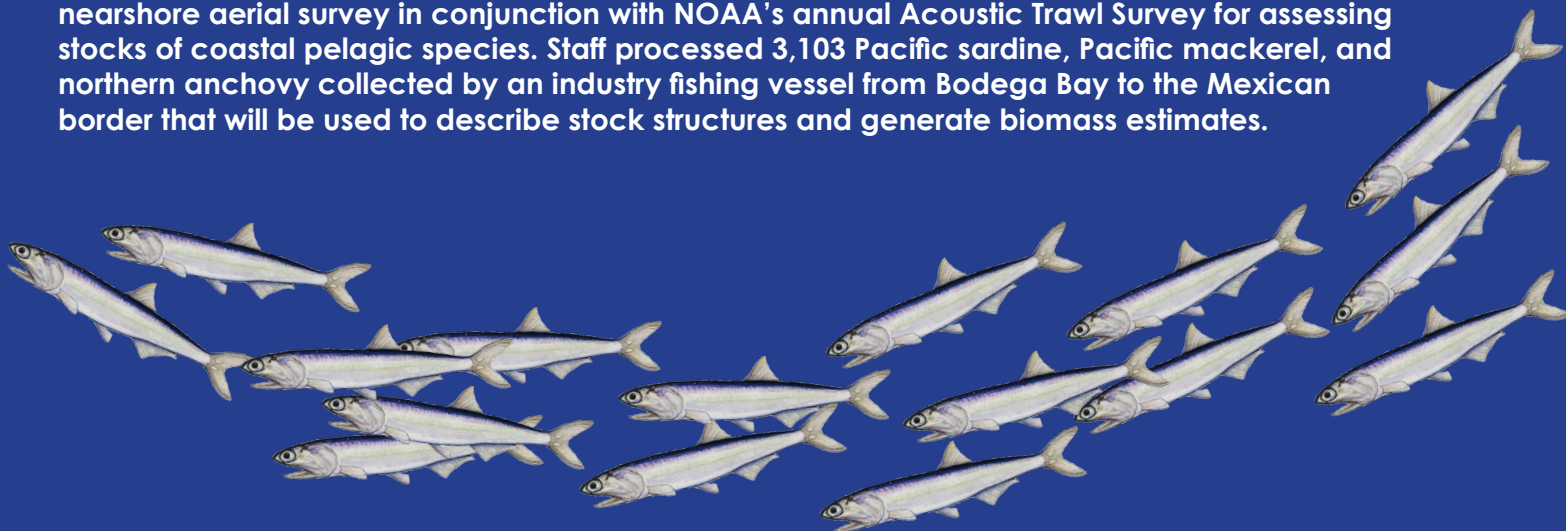


10.3. Pacific Bluefin Tuna, *Thunnus orientalis*

Marine Region staff continued to monitor Pacific bluefin tuna landings in California. In September, purse seine landings picked up, and staff coordinated closely with NOAA providing real-time updates of catch. Cumulative commercial landings approached 250 metric tons (mt) in mid-September, and NOAA notified the fleet that the catch threshold would be met and trip limits would be reduced from 20 mt to 15 mt. Just a few days later, Marine Region staff again communicated to NOAA that the next catch threshold of 300 mt would be met, and NOAA notified the fleet that trip limits would be further reduced to 3 mt. The close coordination between Marine Region staff and NOAA meant that the fleet was notified in a timely manner as catch thresholds were reached. This ensured that the total annual commercial catch remained within the established quota.

10.4. Pacific Sardine, *Sardinops sagax*, Pacific Mackerel, *Scomber japonicus*, and Northern Anchovy, *Engraulis mordax*

Marine Region staff once again collaborated with NOAA's SWFSC and industry to complete a nearshore aerial survey in conjunction with NOAA's annual Acoustic Trawl Survey for assessing stocks of coastal pelagic species. Staff processed 3,103 Pacific sardine, Pacific mackerel, and northern anchovy collected by an industry fishing vessel from Bodega Bay to the Mexican border that will be used to describe stock structures and generate biomass estimates.



10.5. Barred Sand Bass, *Paralabrax nebulifer*

Marine Region staff completed the fifth year of barred sand bass monitoring in the fall to assess their abundance and size structure. A combination of scuba and baited remote underwater video (BRUV) surveys was completed at 10 sites throughout Southern California. The survey data tracked a large number of sublegal fish becoming legal sized in 2022. Barred sand bass spawning aggregations likely occurred for the second year since the mid-2010s. This assumption is based on sizeable landings during a brief period of time from historical aggregation sites. While this is encouraging for the future of the population, signs of another significant recruitment of juvenile barred sand bass have not been seen.



Watercolor illustration of northern anchovy by CDFW Environmental Scientist Claudia Makeyev - CDFW. BRUV footage of sheephead and kelp bass - CDFW.

10.6. Pacific Halibut, *Hippoglossus stenolepis*

The Department continued to actively manage the recreational Pacific halibut fishery in California waters. The 2022 season ended on August 7 after the Department, the International Pacific Halibut Commission, Pacific Fishery Management Council and National Marine Fisheries Service determined the state's quota was attained. Final 2022 recreational catch estimates totaled 48,009 net pounds – or 124 percent of the 38,740 net pound quota.

In 2022, six vessels participated across three open periods in the commercial directed fishery; the preliminary landings into California ports totaled 4,729 net pounds.

10.7. California Halibut, *Paralichthys californicus*

The full enhanced status report (ESR) for California halibut (halibut) became available on the Marine Species Portal. The ESR includes information on the life history of the species, the complicated dynamics of this multi-sector statewide fishery, the existing management framework, and future management needs. The ESR is intended to support management decisions and increase transparency regarding available information. Additional information about halibut management can be found on the California Halibut Management Process web page. Stakeholders are encouraged to subscribe to receive email updates and participate in the process.

A common goal of the Department, halibut trawl fishermen, and environmental advocacy groups is the prevention and reduction of bycatch. The national Bycatch Reduction Engineering Program (BREP) provides funding for selected studies that are working towards innovative solutions to bycatch concerns. In close collaboration with NMFS, UCSC, halibut trawl fishermen, and the West Coast Groundfish Observer Program, the Department started work on a 2-year bycatch study funded by BREP. The collaborative research study, titled “Fish-Gear Interactions in the California Halibut Bottom Trawl Fishery”, was awarded \$133,720 to evaluate fish interactions with fishing gear in order to develop bycatch reduction measures for green sturgeon and other non-target species.

As required in Statute, Marine Region staff initiated an assessment of the effect, if any, of light touch trawl gear on bycatch and biogenic habitat within the California Halibut Trawl Grounds in Southern California. In July, staff began onboard observation of the fishing activities of two cooperating trawl vessels, documenting catch composition by species and disposition, and noting evidence of habitat impacts.

Below left: West Coast Groundfish Observer Program (WCGOP) observers: CDFW Environmental Scientists Jason Gronich, Justin Cordova, Kristen Duncan; NOAA SWFSC Nicholas Demetras; WCGOP Paul Stephens; CDFW Environmental Scientist Kristine Lesyna; WCGOP Kevin Stockmann.

Below right: Halibut trawl fisherman Rick Risso, WCGOP observer Paul Stephens, and the camera technician from NOAA SWFSC, Nicholas Demetras, getting ready to do a collaborative visual study of trawl gear intended to guide innovative ways to reduce green sturgeon bycatch in the California halibut trawl fishery via gear modification - Kristine Lesyna CDFW.



The Department coordinated with partners to evaluate associated landed species and discarded bycatch for the state halibut commercial trawl and gill net fisheries. The results from the evaluation were presented to the California Fish and Game Commission's Marine Resources Committee in November 2022. The Department will continue the bycatch evaluation process for the halibut fishery in 2023 by working with key stakeholders and industry representatives to determine acceptable types and amounts of bycatch for this fishery.

10.8. Grunion, *Leuresthes tenuis*

Marine Region staff continued to monitor grunion runs throughout the spawning season (March through August) to determine grunion abundance on beaches, number of people taking grunion, amount of grunion taken, and compliance with new regulations. In February 2022, the Commission voted to approve two grunion regulation amendments: the addition of June to the seasonal no-take closure; and a daily bag and possession limit of 30 grunion. These new regulations were put in place to give grunion more protection and help increase their population.

10.9. Pacific Herring, *Clupea pallasii*

The 2021-22 commercial fishing season for Pacific herring (herring) in California ended in March. In San Francisco Bay, two vessels landed 24 tons of the available 750-ton quota. Marine Region staff conducted a Rapid Spawn Assessment (RSA) in San Francisco Bay to gauge the quality of spawn deposition and inform the upcoming 2022-23 season quota. Based on the RSA, assessment of ecosystem indicators that are considered as essential fishery information, and after meeting with the Director's Herring Advisory Committee, the Department determined that the precautionary Tier 2 default quota of 750 tons is appropriate for the 2022-23 season.

There was no commercial "herring egg on kelp" activity during the 2021-22 season in San Francisco Bay, and no commercial herring activity occurred in the Tomales Bay, Humboldt Bay, or Crescent City Harbor management areas. Due to a lack of fishing activity in 2021-22, in 2022-23 Humboldt Bay will return to the lowest of the three management tiers, Tier 1, which in the absence of fishing does not require monitoring. Tomales Bay and Crescent City Harbor will remain in Tier 1 where they have been since implementation of the Pacific Herring Fishery Management Plan in 2020.

Watercolor illustration of a Pacific herring by CDFW Environmental Scientist Claudia Makeyev - CDFW.



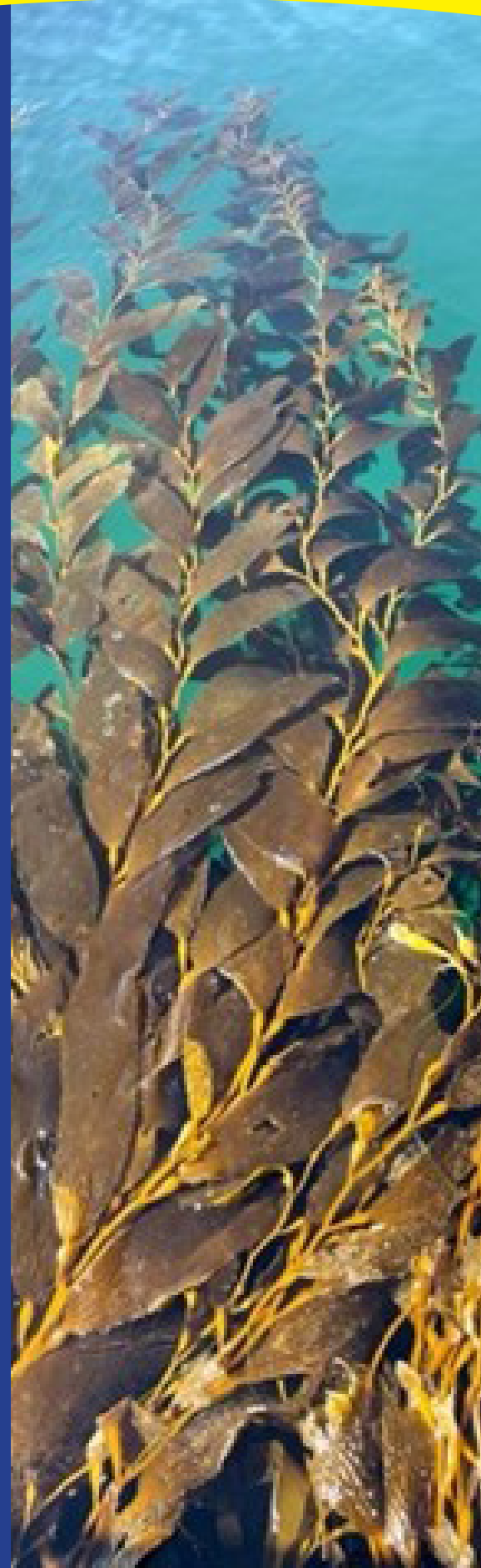
10.10. Kelp and Other Marine Algae

The [Giant Kelp and Bull Kelp ESR](#) was added to the [Marine Species Portal](#). Staff also prepared a regulatory package proposing a temporary prohibition of commercial bull kelp harvest in Sonoma and Mendocino counties, an annual fishery limit of 8,000 pounds wet weight in Humboldt and Del Norte counties, and other measures to protect bull kelp in northern California. The California Fish and Game Commission adopted the regulatory changes in early 2022 and adopted additional administrative modifications in October 2022. The [regulations effective date is January 1, 2023](#), and the temporary changes will sunset three years from the effective date.

The Department, in close collaboration with the California Ocean Protection Council (OPC) and other partners, initiated the development process for a statewide, ecosystem based, climate-ready Kelp Restoration and Management Plan for giant kelp and bull kelp. The Department continued to address several priority actions identified in the [2019 Bull Kelp Recovery Plan](#) and [2021 Interim Kelp Action Plan](#) through partnerships and coordination with several other state and federal agencies, non-profit organizations, and coastal communities. Highlights include the continuation of testing experimental kelp restoration methods (e.g., grazer suppression, kelp enhancement), supporting the [Kelp Recovery Research Program](#) which guides solution-oriented research essential to informing kelp management and recovery, surveying potential kelp restoration sites along the Sonoma County coast, and contributing to the Roadmap to [Recovery for the Sunflower Sea Star](#).



Commercial urchin vessel at Van Damme - Christy Juhasz CDFW.
Giant kelp floating in Monterey Bay - Laura Rogers-Bennett CDFW.



11. AQUACULTURE AND HATCHERIES

11.1. Ocean Resources Enhancement and Hatchery Program

Marine Region staff continued to build upon the Ocean Resources Enhancement and Hatchery Program's (OREHP) management and research priorities from the previous year, while overseeing ongoing white seabass research and enhancement. In January, the Director established an independent Scientific Advisory Committee (SAC) consisting of eight members with expertise in fish genetics and health, marine aquaculture, fish population biology and dynamics, benthic and water quality, and stock enhancement. The goals of the SAC are to advise the Department and the Ocean Resources Enhancement Advisory Panel on program research activities and to help ensure scientific integrity and transparency within the OREHP. The SAC focused on establishing bylaws and committee organization, reviewing the recommendations in the 2017 OREHP Evaluation Report, and organizing a peer review of a white seabass genetic study led by the South Carolina Department of Natural Resources. In October, the Department began soliciting nominations to fill vacant seats on the SAC, and the Director appointed new SAC members in December.

In January, the Department contracted with California Sea Grant to conduct an in-depth and extensive survey of OREHP stakeholders. The goal of this effort is to create a collaborative process for developing a vision, evaluation criteria, and options for the future of OREHP. The two-year process will result in a final Sea Grant report to the Department by January 2024.

11.2. Marine Aquaculture

Marine Region staff provided oversight and management of aquaculture activities in California while ensuring marine resources and essential habitats are protected. Staff evaluated a range of projects throughout the state, including proposals for an intertidal aquaculture program in Humboldt Bay and a large scale land-based fish farm in Humboldt County. Staff also reviewed and processed aquaculture registrations, live importation permits, restricted species permits, wild broodstock collection permits, and scientific collecting permits.

At the direction of the Commission, the Department led an effort to develop criteria to determine if aquaculture lease applications are in the public interest. Department staff developed and revised draft criteria based on feedback from government agencies, non-governmental organizations, and stakeholders, including co-hosting two public workshops with the Commission. Staff continued to collaborate on the development of a Statewide Aquaculture Action Plan led by OPC which will serve as a comprehensive, science-based framework for marine aquaculture in California that balances ecosystem health with sustainable development.

State-federal coordination continues for offshore aquaculture in Southern California as part of the effort led by the National Oceanic and Atmospheric Administration (NOAA) to implement the presidential Executive Order on Promoting American Seafood Competitiveness and Economic Growth. In July, staff submitted a comment letter in response to NOAA's release of a Notice of Intent to Prepare an Environmental Impact Statement for the identification of one or more Aquaculture Opportunity Area(s) in Southern California. Marine Region staff will continue to engage in this effort as the selected locations are further evaluated through the National Environmental Policy Act process.



12. INVASIVE SPECIES AND OFFSHORE WIND ENERGY

12.1. Invasive Algae in Newport Bay

The multi-agency effort to address the *Caulerpa prolifera* infestation in Newport Bay continued, with both the identification of a new infestation location and new eradication efforts. Working with state and federal agency partners, the Department helped secure more than one million dollars for future eradication efforts through the Invasive Species Council of California.

12.2. Offshore Wind Energy Development

Staff continued to work with state and federal agency partners on offshore renewable wind energy development being considered both in state and federal waters off California. Staff increased collaboration and led outreach with recreational and commercial fishing groups on both the north coast and central coast. The first lease sale of offshore wind in both the north and central coast occurred on December 8, 2022. Staff will continue collaboration and outreach efforts as these projects move forward.

CAULERPA ALERT!

We are counting on you to prevent the next invasion of the destructive aquarium seaweed *Caulerpa*!

Caulerpa is a non-native invasive algae. It can grow quickly, choking out native seaweeds and seagrasses and harming marine life through lost habitat. Do not let it escape into the wild!

Humans are the cause of Caulerpa introductions and humans have the power to prevent them. Nine species of Caulerpa are banned in California. Educate yourself and encourage others to practice good environmental stewardship. Please do not buy, sell or distribute Caulerpa, or use in your aquarium.

Use these algae alternatives: *Chaetomorpha*, *Gracilaria*, *Ulva*, and *Halimeda* (not pictured here)

Three Caulerpa species are shown here:

C. prolifera

C. racemosa

C. taxifolia

5 Tips

- 1** FREEZE Caulerpa and attached substrate for at least 48 hours.
- 2** DISPOSE of frozen Caulerpa in garbage, Do NOT put this algae into the sewer system or storm drain.
- 3** BLEACH aquarium water before disposing of it. 1/3 cup of bleach per gallon of water, ~3%, for 10 minutes.
- 4** DUMP bleached aquarium water in a household drain that leads to a treated sewer system.
- 5** DO NOT DUMP ANY aquarium species or water into the ocean, any water body, or anywhere that leads to a storm drain.

California Department of Fish and Wildlife

sccat

To See Photos and Report A Sighting:
<https://wildlife.ca.gov/Conservation/Invasives/Species/Caulerpa>

2022 Caulerpa outreach flyer - CDFW.

13. MARINE REGION PUBLICATIONS

California Department of Fish and Wildlife. 2022. [California's Marine Protected Area Network Decadal Management Review](#).

Dorval E., D. Porzio, B.D. Schwartzkopf, K.C. James, L. Vasquez, B. Erisman. 2022. [Sampling methodology for estimating life history parameters of coastal pelagic species along the U.S. Pacific Coast](#). U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-660.

Lynn K., E. Dorval, D. Porzio, T. Nguyen. 2022. [A Collaborative Aerial Survey of Coastal Pelagic Species in Nearshore California Waters](#). Fisheries 47: 500-508.

Ugoretz J., E.A. Hellmers, J.H. Coates. 2022. [Shark incidents in California 1950-2021; frequency and trends](#). Frontiers in Marine Science 9:1020187.

Van Diggelen A.D., S.E. Worden, A.J. Frimodig, S.P. Wertz. 2022. [California's lessons learned and recommendations for effective marine protected area network management](#). Marine Policy 137:104928.

Ziegler S.L., R.O. Brooks, S.L. Hamilton, B.I. Ruttenberg, J.A. Chiu, R.T. Fields, G.T. Waltz, C. Shen, D.E. Wendt, R.M. Starr. 2022. [External fishing effort regulates positive effects of no-take marine protected areas](#). Biological Conservation 269:109546.