CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

MARINE REGION

2018 YEAR IN REVIEW

Message from the Regional Manager

We are fortunate to live in an era where we have massive amounts of data at our fingertips. With a few clicks of the mouse, we can pull up almost any fact from recorded or geologic history. When I come across something extraordinary, I often find it comforting to look back across the historical record to see that this is not the first time that society or, in some cases, the planet has experienced that event.

It is with this in mind that I find the numerous climatic records broken in 2018 troubling. Many of you may recall that it was really hot throughout much of California last summer. The Van Nuys airport broke the all-time record at a blistering 117° F on July 6, 2018, with downtown Los Angeles and UCLA recording 108° F and 111° F, respectively. This was part of a global heat event that saw what is possibly an all-time high for Africa of 124° F and numerous heat records around the globe. These heat records correlate with the global trend of rising carbon dioxide. As measured in ice cores, over the past 400,000 years global carbon dioxide levels never rose above 300 parts per million. The planet reached that level in 1950 and is currently over 400 parts per million. These records are consistent with the unprecedented rates of change in our climate that are manifested in more pronounced periods of drought, heat waves, floods, and fire. Fire "season" in California continues to grow longer and more widespread. Tragically, 2018 saw both the largest (Mendocino Complex fire in July) and deadliest (Camp Fire in November) wildfires in California history.

The ocean is also experiencing a wave of new records. 2017 was proclaimed the warmest year on record for the global ocean in a peer-reviewed article published in the journal *Advances in Atmospheric Sciences* and on August 1, sea surface temperature at the Scripps Pier hit 78.6° F, the warmest sea surface temperature recorded there since measurements began in 1916. Arctic sea ice and ice sheets are continuing to decrease and sea level continues its rising trend.

While many of us enjoyed basking in the warm ocean waters this past summer, and some took advantage of the great fishing opportunities, I can't help but wonder what price we might pay for these record-setting conditions. Will periodic closures of our iconic Dungeness crab and lobster fisheries due to harmful algal blooms become the norm rather than the exception? Are the warm waters in Southern California related to the conditions in Central and Northern California that have led to widespread loss of kelp, urchin barrens and the closure of our beloved recreational abalone fishery?

The Fourth National Climate Assessment released in late November 2018 found that coastal communities and the ecosystems that support them are increasingly threatened by the impacts of climate change. We must be prepared to manage the impacts of warmer water temperatures, ocean acidification, sea level rise, and coastal erosion that are projected to change coastal ecosystems, threatening historic fisheries, ecosystem services, and our coastal communities.

The ocean is unpredictable and dynamic, but we have been able to use our observational records to tease out recurring trends such as the El Niño Southern Oscillation and the Pacific Decadal Oscillation to inform our approaches to management. We must now learn to adapt to possible new and unforeseen ocean events such as the warm water blob of 2015 that may not follow a predictable cycle, or recur in a cycle we do not yet understand.

While all this possible doom and gloom may seem overwhelming, we must remember that we have overcome huge environmental problems before. Over the last 50 years our air and water have gotten considerably cleaner and we have brought back several species from the brink of extinction, including California's iconic brown pelican. As the group of individuals responsible for the sustainable management of California's marine resources, staff in the California Department of Fish and Wildlife's Marine Region will remain vigilant. Working with our partners, we will continue to enact data collection and management measures that account for both the anticipated and unanticipated changes we see on the horizon. This will enable us to meet daunting challenges head-on and fulfill our mission to *protect, maintain, enhance, and restore California's marine ecosystems for their ecological value and their use and enjoyment by the public through good science and effective communication.*

- Dr. Craig Shuman, Marine Region Manager

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On The Cover: Kelp Bass and a school of Salema over a surfgrass bed at Laguna Beach State Marine Reserve. photo by S. Wertz

2018 Marine Region-Wide Updates

Administration

The accomplishments of the Marine Region would not be possible without the work of our administrative staff. Administrative staff work tirelessly behind the scenes to support Region staff, ensuring that they have the tools they need to get the job done. Marine Region administrative staff manage storage and office facilities for staff and vessels, procure supplies for field work, laboratories, and offices while managing and staying within the Region's budget. Administrative staff also help staff conform to state laws and California Department of Fish and Wildlife (CDFW) policies as they work to help the Marine Region achieve its goals.

California Cooperative Fisheries Investigations (CalCOFI)

The Marine Region hosted the 2018 CalCOFI meeting in December that included a symposium titled "Spatial Dynamics and Organization of Populations in Response to Environmental Parameters." The symposium highlighted current efforts to better understand the spatial dynamics of marine resources in response to environmental factors and the ability to predict or forecast them. Topics included population shifts, egg production, modeling, applications for stock assessments, and other areas with management implications. In addition, the Marine Region joined UC Davis to host a special mini-symposium that included a panel session moderated by Marine Region staff. The mini-symposium focused on "Emerging Tools in Adaptive Management of California's Marine Protected Areas." Staff presented several informational posters about coastal pelagic and highly migratory fisheries, and marine protected area management. Staff also gave a presentation on the MPA Monitoring Action Plan.

Electronic Reporting for Commercial Fisheries Landings

CDFW, in collaboration with Pacific States Marine Fisheries Commission, launched a web-based fish ticket application called "E-Tix" that will be used for all California commercial fisheries landings. E-Tix went live for California state fisheries on July 1, 2018 for a transitional one-year period. The use of E-Tix is a notable accomplishment for CDFW and a significant step forward in modernizing California's fisheries landing reporting system. In addition, CDFW's Data and Technology Division replaced the outdated Commercial Fisheries Information System with a new, modern Marine Landings Data System (MLDS) to house and manage landings data. All data submitted using E-Tix will be automatically transferred to MLDS twice a day to produce near real-time landing records.

Staff from across the Marine Region played instrumental roles in the Region's transition from paper landing receipts to electronic records, as well as replacing the Commercial Fisheries Information System with the new MLDS. Staff identified data management concerns with the new system and developed changes to field data collection methods to ensure that management needs are met during the transition.

Staff also developed new ways to conduct the needed QA/QC to ensure the maintenance of accurate data when paper receipts are no longer available to compare with the electronic data. Prior to its rollout, project staff spent significant time testing MLDS functionality to identify technical issues and ensure data accuracy and accessibility. In addition to these internal support needs, staff assisted with preparation of outreach materials for fish buyers to inform them of the new processes for submitting and recording landings information.

Marine Life Management Master Plan

At its June 2018 meeting in Sacramento, the California Fish and Game Commission voted unanimously to adopt the *2018 Master Plan for Fisheries: A Guide for Implementation of the Marine Life Management Act*. Adoption of the 2018 Master Plan was the culmination of over two years of collaborative efforts, and sets the stage for implementation of the plan.

Initial implementation included work throughout the Marine Region on the development of Enhanced Status Reports for various state-managed species, which will be released in 2019. In addition, Marine Region staff worked with partners to develop a socioeconomic guidance document that would inform implementation of the 2018 Master Plan. This document will help staff to build socioeconomic narratives that can be incorporated into management documents (for example Enhanced Status Reports, Fishery Management Plans, and California Fish and Game Commission rulemakings) to better describe socioeconomic conditions and impacts related

to how fisheries are managed. The final guidance document can be accessed at www.opc.ca.gov/socioeconomic-guidance-for-fisheries-management/

New Resources for the Marine Region

The 2018-2019 State Budget allocated new funding and positions to CDFW to (1) continue the current level of service for core fish and wildlife program; (2) augment high-priority programs that are consistent with the priorities identified in the most recent update to the Strategic Vision report; and (3) initiate an independent, service-based budget review and develop a tracking system to support an analysis of CDFW's existing revenue structure and program activities.

The augmentation of high-priority programs included eleven new positions to focus on marine fisheries management and data streamlining. Working in conjunction with CDFW's Data Technology Division, Marine Region staff spent the second half of 2018 filling the new positions and working on the focal areas that include state-managed sustainable fisheries under the 2018 Master Plan for Fisheries, climate change and fisheries, fisheries innovation, whale-safe fisheries, and centralized electronic data collection, monitoring, and reporting.

Whale and Turtle Safe Fisheries

Maintaining whale and turtle safe fisheries continues to be a high priority for the Marine Region. Leveraging existing resources with new positions established in the 2018-2019 budget, we expanded our efforts and prepared for new authority from the State Legislature in an effort to reduce whale and turtle interactions with state-managed fisheries.

The Dungeness Crab Fishing Gear Working Group met throughout the year to continue to develop the Risk Assessment and Mitigation Program (RAMP). The 2017-2018 Dungeness crab pre-season assessment identified a moderate entanglement risk due to the potential overlap of whale distributions and gear deployment. Aerial surveys conducted shortly after the season opened in both the northern and southern fishery management areas suggested that risk was low because whales were largely offshore, away from the majority of trap gear. In early June, an evaluation team was convened in response to an increase in reported entanglements. Since the season was nearly over and scheduled to close in the area of concern on June 30th, the Working Group recommended a low level of management intervention by encouraging the fleet to follow the Best Practices Guide. During 2018 and 2019 the RAMP will assess entanglement risks for both blue and humpback whales in relation to forage, fishing activity, and ocean conditions. New legislation (SB 1309) gives the CDFW Director interim authority to close the Dungeness crab fishery based on increased marine life entanglement risk while the RAMP is developed. The RAMP will be formalized in regulation on or before November 1, 2020.

The Working Group distributed an updated Best Practices Guide prior to the 2018-2019 Dungeness crab fishing season, and obtained funding from the California Ocean Protection Council to install solar data loggers on 40 commercial fishing and 20 whale watching vessels. Solar data loggers are expected to improve data streams and allow for real-time analyses of fishing activity and whale distributions.

On November 26, 2018, CDFW formally notified NOAA National Marine Fisheries Service of its intent to pursue an Incidental Take Permit under Section 10 of the Endangered Species Act, which would consider whale and turtle interactions with gear from the Dungeness crab fishery. Additional updates will be available at www.wildlife.ca.gov/Crabs.

New regulations were enacted to reduce the risk of marine life entanglements in commercial Dungeness crab fishing gear. These new regulations establish limits on the number of additional buoys that can be attached at the surface after the main buoy and the maximum length of line.

E-Tix is a notable accomplishment for CDFW and a significant step forward in modernizing the state's fisheries landing reporting system.

State-Managed Marine Programs

These programs are responsible for fisheries managed by the State alone.

Abalone dive survey briefing photo by K. Joe

Abalone

Recreational Red Abalone Fishery – The red abalone stock continued to decline due to sustained poor environmental conditions along the North Coast. At its December meeting, the California Fish and Game Commission approved keeping the red abalone fishery closed for two more years. During the closure, CDFW will complete work on a fishery management plan which will specify conditions for reopening the red abalone fishery along with other management parameters.

Over the past five years, ocean warming and a massive purple sea urchin population explosion have taken their toll on red abalone. Normal ocean temperatures in recent years have not offset the detrimental effects from the expanded purple sea urchin population, and abalone populations continued to decline.

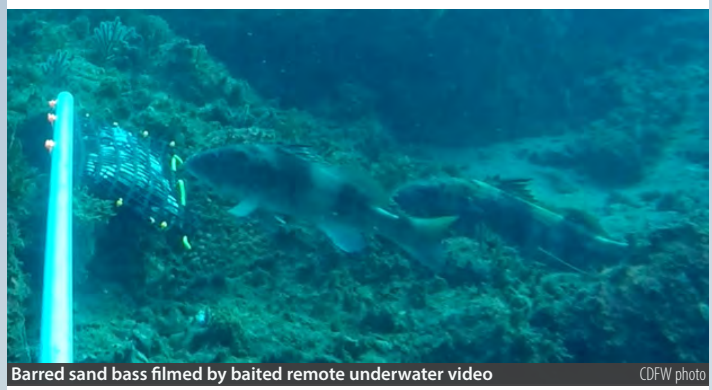
Dive survey efforts in 2018 covered more than the equivalent of 2.7 football fields across seven fished sites with more than 250 hours spent executing underwater surveys. Reproduction was poor in the fishery with few larvae or newly settled red abalone found during the summer of 2018. Surveys revealed that extremely low kelp and algal abundances, likely reduced by large numbers of herbivorous purple sea urchin, continued from previous years and resulted in significant mortality of red abalone in 2018. Red abalone densities continued to decline, with an overall average density of 0.11 abalone per square meter for seven fished sites (closure trigger is 0.3 abalone per square meter).

Red Abalone Fishery Management Plan Progress – The Red Abalone Fishery Management Plan's proposed management strategies and frameworks were peer reviewed in 2018, which is a major milestone in the development process. The year started with several public meetings with the Recreational Abalone Advisory Committee and interested stakeholders to present two proposed fishery management strategies, one put forward by CDFW and the other by a Nature Conservancy-led collaborative stakeholder group. Shortly after the public meetings, CDFW worked with the California Ocean Science Trust to develop and conduct the scientific peer review process to critically review the science supporting the two management proposals. The peer review ran from late spring through early fall and the final report was presented to the California Fish and Game Commission in October. The review found that over all, both management proposals were sound, but each had strengths and weaknesses that resulted in a high level of uncertainty in managing the fishery moving forward. The overarching recommendation was to integrate both management strategies to help reduce the uncertainty and capitalize on the best available science. Further recommendations and advice were provided on how to reduce the management uncertainty of all fishery management indicators. CDFW and the California Fish and Game Commission will work with all interested partners in 2019 to continue development of an all-encompassing management strategy that addresses the peer review recommendations and completes the draft fishery management plan.

Abalone Restoration: Captive Breeding Program for Endangered White Abalone – The White Abalone Restoration Consortium (consisting of CDFW, university, federal, and aquarium scientists), which focuses on restoration of this critically endangered species, continued their work in 2018. The growing production of the Captive White Abalone Breeding Program is progressing towards the first ocean stocking of captive-bred animals. To prepare for that next milestone, staff led efforts to scout potential sites for the outplant of captive-reared white abalone. The first outplant is planned for the fall of 2019. Additionally, staff worked with program partners to generate and submit the next grant project proposal to NOAA Fisheries' Section

6 grant program. If successful, the project grant will continue the restoration program for the next three fiscal years starting July 1, 2019.

For more information about abalone, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/Invertebrates/Abalone.



Barred sand bass filmed by baited remote underwater video CDFW photo

Barred Sand Bass and Kelp Bass

To help evaluate the 2013 regulation changes for the basses, staff completed 48 sampling trips aboard commercial passenger fishing vessels to collect information on numbers, sizes, and mortality of released fish. Staff collected data on more than 2,093 Kelp Bass and 462 Barred Sand Bass. Most discards were between 13 and 14 inches long. In 2018, three percent of Kelp Bass and 20 percent of Barred Sand Bass released suffered barotrauma. All Barred Sand Bass were released alive, while half of one percent of Kelp Bass suffered release mortality.

Staff submitted a research article about using Kelp Bass to assess trophic indicators of ecosystem health in MPAs (Davis, J.P., Valle, C.F., Haggerty, M.B., Walker, K., Gliniak, H.L., Van Diggelen, A.D., Win, R.E. and S.P. Wertz. 2019. *Testing trophic indicators of fishery health in California's marine protected areas for a generalist carnivore.* Ecological Indicators. 97: 419-428. doi.org/10.1016/j.ecolind.2018.10.027). The study was a collaboration between Marine Region scientists on the Southern California Fisheries Research and Management Project and the Statewide Marine Protected Area Management Project. The results showed that non-lethal sampling of fin tissue from Kelp Bass will be effective for future stable isotope studies assessing their feeding level. The study also found that impacts of no-take marine protected areas on kelp forest food webs were variable across locations, and that opportunistic feeding by generalist predators on pelagic sources may mask the effects of management.

Staff completed fishery-independent surveys of Barred Sand Bass for the second consecutive year during fall 2018. Preliminary results from a pilot study in 2017 indicated that Barred Sand Bass were more common during the fall at artificial reefs off Los Angeles County. Results from the pilot study are currently being analyzed and prepared for publication in 2019. Between September and November 2018, CDFW divers and staff completed fall fish surveys aboard the R/V *Garibaldi* at two natural and four artificial reefs near Los Angeles Harbor and the Palos Verdes Peninsula. Standardized counts of Barred Sand Bass were recorded on scuba and baited remote underwater video. An additional survey site was investigated at the Hermosa Beach artificial reef, which appeared promising and will be incorporated into the 2019 survey design. Surveys using both methodologies will continue to provide a long-term dataset of Barred Sand Bass abundance annually.

Staff continued to test the use of length-at-age-based models and management strategy evaluation for managing the bass fisheries. The Data Limited Methods Toolkit is being explored as an option for using management strategy evaluation, with Kelp Bass as one of the new test case species. Staff worked on gathering and analyzing data to be used in the toolkit. A completed manuscript of the Barred Sand Bass age and growth study was submitted for publication.

For more information about bass research and management, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/SCFRMP.

Fish sampling on the Eel River Estuary CDFW photo by A. Frimodig

Bay and Estuary Management

Humboldt Bay – Staff completed the final year of field sampling and associated reporting for a project evaluating the spawning and larval distribution of Longfin Smelt in Humboldt Bay and its tributaries, which was funded by a state wildlife grant program.

In collaboration with California Sea Grant, Humboldt State University, Hog Island Oyster Company and the Wiyot Tribe, staff assisted with the design and implementation of a multi-year project to 1) understand

how physical and biological factors in Humboldt Bay may alter ocean acidification conditions compared to open coastal waters; 2) investigate the extent to which eelgrass reduces the impact of ocean acidification on the growth of commercially grown oysters in Humboldt Bay, and 3) expand eelgrass monitoring within Humboldt Bay as the foundation for a collaborative bay-wide eelgrass management plan.

Eel River Estuary – In collaboration with CDFW's Northern Region, staff participated on the management team for the Ocean Ranch Estuary Restoration Project to restore 473 acres of tidal wetlands in the Eel River estuary. As part of the baseline data collection effort, staff designed and implemented a monitoring plan to characterize the seasonal fish assemblage within CDFW's Ocean Ranch Unit.

Russian River Estuary – Staff completed an accuracy assessment of the 2010 Ocean Imaging marine protected area eelgrass spatial data on the Russian River Estuary, which misclassified 11.36 acres of widgeon grass (*Ruppia maritima*) as eelgrass in that estuary; the determination was made that there is no eelgrass habitat in the Russian River estuary.

Estero Americano and Estero de San Antonio Estuaries – In collaboration with the Environmental Review Project, staff surveyed and mapped eelgrass habitat in these two estuaries located in Sonoma and Marin counties, respectively.

Tomales Bay – Staff received the 2017 Greater Farallones National Marine Sanctuary Tomales Bay eelgrass spatial dataset. These data were incorporated into the Northern California eelgrass spatial dataset, replacing the previous 2013 CDFW Tomales Bay Eelgrass spatial dataset. The dataset is a valuable resource for managing aquaculture leases.

Staff began developing methodology for using unmanned aerial vehicles to map eelgrass habitat and gauge potential associated sport clamming impacts, in collaboration with CDFW (non-Marine Region), GIS, and Invertebrate Management Project staff.

San Francisco Bay – Staff received 2,500 new Bay Shrimp Logs (= 50 logbooks) from the Office of State Publishing. In 2018, staff distributed 900 logs to four of the six active trawlers in the bay shrimp fishery and worked with CDFW's Law Enforcement Division to address bay shrimp fleet compliance issues. Staff also provided boat support to the National Parks Service Golden Gate National Recreation Area for a federal sea cave mapping study.

For more information about bay and estuary management, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/ABMP/Research.

Box crab CDFW photo by J. Coates

Box Crab

Commercial landings of non-*Cancer* crab species caught incidentally in other targeted trap fisheries increased dramatically in 2017. The interest in (and increased landings of) brown box crab was particularly large. In response, the CDFW Director declared non-*Cancer* crabs to be an emerging fishery in April 2018. CDFW staff developed a regulatory proposal to limit incidental take of these species, which was adopted by the California Fish and Game Commission in October. Concurrent with the regulatory proposal, staff developed a proposal for a collaborative research program with fishermen to investigate the feasibility of creating a target fishery for box crab under experimental gear permits. Recommendations for the program were shaped by constituent feedback through regular communication with CDFW staff, public constituent meetings, and the California Fish and Game Commission's Marine Resources Committee meetings. With support from the California Ocean Protection Council, the research program will use electronic fishery monitoring tools both in studying box crabs and to provide guidance to the State on potential future use of this technique. Experimental permits were approved at the December California Fish and Game Commission meeting and will allow for program initiation in 2019.

For more information about box crab, download the CDFW presentation available at nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=160457.

Researchers confirmed that there is no eelgrass habitat in the Russian River estuary.

Juvenile California Halibut CDFW photo by B. Mattioli

Fishery-independent trawl surveys began in 2018 to help determine juvenile California Halibut abundance.

California Halibut

The California Halibut (halibut) fisheries in Central California continued to be monitored and sampled by staff in the Monterey Bay, San Francisco, and Eureka areas. In all areas, recreational catch and commercial landings increased, primarily due to strong recruitment of legal-sized fish. Commercial trawl and hook-and-line landings and recreational catch were sampled dockside, trawl bycatch samples were collected, and observations were made onboard commercial passenger fishing vessels. Juvenile halibut were collected from a research trawler in San Francisco Bay. Observations of new fishery recruits declined, and most juveniles appeared to be from past recruitment events. Due to previous episodes of good recruitment likely associated with prolonged warm water events three to four years ago, significant amounts of under-sized halibut were encountered in the recreational hook-and-line fisheries for the second year in a row.

Staff have now determined ages for 4,000 halibut otoliths (ear bones) from Northern and southern California by examining thin sections, and an age validation study is under way using captive juvenile halibut injected with oxytetracycline, which marks the otolith.

Staff collaborated with the National Marine Fisheries Service to conduct oral interviews with halibut trawl fishermen about the history of the industry. This project was funded through a grant with Preserve America. Fisherman summary profiles accompanied by selected clips and photos will be made available to the public on CDFW's Finfish Management Project web page, with a link to the full interview and transcript, which will be housed in the NOAA Fisheries "Voices from the Fisheries" database.

The first year of fishery-independent trawl surveys were conducted to begin quantifying an index of juvenile halibut abundance across multiple embayments and nearshore locations in Southern California. Eleven locations from Oceanside Beach in San Diego County to Santa Monica Bay in Los Angeles County were surveyed in spring and fall 2018. During the spring surveys, 247 halibut ranging in size from 3½ in. to 25 in. (89 to 643 mm) were caught in 85 ten-minute trawls. In the fall, 415 individuals ranging in size from 1.2 in. to 16 in. (32 to 409 mm) were caught in 97 ten-minute trawls. One halibut tagged during the spring surveys was recaptured in the same location in the fall; it was caught in the Dana Point Harbor and grew .66 in. (17 mm) in the five months between surveys. These index-focused trawl surveys and collaboration with the Southern California Bight 2018 Regional Monitoring Program contributed 38 halibut to the Northern/Central California Finfish Research and Management Project's aging study.

Staff developed separate stock assessments for northern and southern California populations of halibut. The process involved analyzing more than 47 years of fisheries, survey, and biological data obtained from a variety of sources, including CDFW, NOAA Fisheries, and the Pacific States Marine Fisheries Commission. Staff applied sex-structured statistical catch-at-age models to those data using the NOAA Fisheries program Stock Synthesis, and critically evaluated the model output. An external peer review panel will be convened to review the results in 2019 after an internal review of the results is completed.

Staff continued to develop a management strategy evaluation for halibut in conjunction with the Data Limited Methods Toolkit project. Staff built an operating model that simulates halibut population dynamics and continues to test this 'virtual fishery' under a wide range of management scenarios. The goal is to determine the likelihood of achieving certain sustainability and performance metrics into the future, given different management approaches.

For more information about California Halibut, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/NCCFRMP/Halibut-Studies and wildlife.ca.gov/Conservation/Marine/SCFRMP/Halibut.

California Sheephead CDFW photo by M. Elyash

California Sheephead

Staff collaborated with the Sportfishing Association of California to develop sampling protocols and collect California Sheephead for a potential fillet length regulation. A total of 180 California Sheephead collected via live trapping were measured and filleted on three sampling trips at Long Beach, Dana Point and Point Loma. The relationship between total length and average fillet length was used to inform a proposed minimum fillet length. The information was presented to the California Fish and Game Commission as a proposed California Sheephead fillet length regulation.

California spiny lobster CDFW photo by B. Mattioli

California Spiny Lobster

New regulations to implement the Spiny Lobster Fishery Management Plan went into effect during the 2017-2018 commercial and recreational lobster seasons. Regulation changes included a commercial lobster trap limit of 300 traps, a trap tag program, a new recreational season opening time of 6:00 a.m. (previously midnight), and hoop net marking requirements. Staff produced outreach materials and answered a variety of questions from the public regarding the new regulations.

The 2017-2018 lobster fishing season saw just over 688,000 pounds of lobster landed by the commercial fishery, a 5 percent increase from the previous season (~656,000 pounds were landed in the 2016-2017 season). The 2017-2018 recreational lobster season saw a lobster report card return rate of 50 percent, a rate that has held steady for the last few years. The estimated catch for the recreational fishery was approximately 275,000 pounds, or 29 percent of the total (commercial plus recreational) catch.

In 2018, the first annual review of the Spiny Lobster Fishery Management Plan harvest control rules was completed, evaluating the 2016-2017 season. All three indicators (catch, catch per unit effort, and spawning potential ratio) fell above the threshold value and no management actions were triggered. Staff will continue to monitor and adaptively manage the fishery as prescribed by the fishery management plan, in response to changes in fishery and ocean conditions.

The 2017-2018 commercial lobster season was the first season in which lobster operator permit holders were required to complete and submit an End of Season Spiny Lobster Trap Loss Reporting Affidavit (affidavit, CDFW Form 1020). This new requirement is part of a suite of changes to commercial lobster fishing regulations associated with the fishery management plan. The data collected from the affidavit will help CDFW estimate the number of traps lost during a season as well as inform gear recovery programs and studies aimed at minimizing the impacts of fishing gear interactions in the marine environment.

Upon the conclusion of the 2017-2018 commercial lobster season, CDFW saw an affidavit submittal rate of about 90 percent. The estimated average trap loss per active permit holder was approximately 12 percent of the maximum allowed number of traps (300 traps per lobster operator permit). An updated estimate of trap loss based on the reported number of deployed traps will be provided once commercial lobster fishing logbook data become available.

Due to human health concerns caused by high levels of domoic acid in lobster, waters around Anacapa Island, Ventura County and the east end of Santa Cruz Island, Santa Barbara County were closed to the commercial take of spiny lobster on October 16, 2018, as recommended by state health agencies. Staff coordinated with the California Department of Public Health and the Office of Environmental Health Hazard Assessment to inform the public and commercial fishery participants of the area closures via press releases and updates on the CDFW website. The commercial spiny

lobster fishery closure was lifted on November 16, 2018.

For more information about California spiny lobster, visit the Marine Region website at wildlife.ca.gov/Conservation/Marine/Invertebrates/Lobster. The Spiny Lobster Fishery Management Plan and the first harvest control rule report can be found at wildlife.ca.gov/Conservation/Marine/Lobster-FMP.

CDFW divers practice rescue techniques CDFW photo by D. Osorio

Diving Safety Program

The Diving Safety Program maintained an enviable safety record in 2018 while supporting an unprecedented level of collaborative dive activity. CDFW divers completed 2,100 dives (amounting to 48½ days under water) while conducting research and monitoring for fisheries and conservation work, and enforcement and light maintenance tasks. In addition to re-qualifying 70 active divers, six new candidates were qualified as CDFW Scientific Divers at the 100-hour training course in the spring.

CDFW's underwater efforts were achieved with the assistance of divers from 18 scientific diving organizations (universities, agencies, and others) that provided 92 visiting divers to work on collaborative projects.

The acquisition of two new breathing air compressor systems funded through the California Ocean Protection Council was a significant infrastructure improvement that will support ongoing fishery management and MPA monitoring efforts throughout California.

For more information about the Diving Safety Program, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/Diving-Safety.

CDFW divers completed 2,100 dives, equal to 48½ days under water.

Dungeness crab in recreational crab trap photo by K. Joe

Dungeness Crab

The 2017-2018 commercial Dungeness crab season opened on schedule in the central management area, but the northern management area opening was delayed due to poor meat recovery results. Although the northern area opened on January 15, 2018, the fleet voluntarily remained tied to the docks until early February given concerns of persistent low crab meat recovery in Northern California. Statewide commercial landings for the season totaled 20.2 million pounds, 75 percent of which was landed in the northern ports. Low meat recovery-associated delays in the northern management area have historically correlated with high crab yields for the region.

In June, CDFW was notified of the allocation of $25.6 million in federal disaster relief for the 2015-2016 Dungeness and rock crab fishery disasters. CDFW staff held two informational webinars to discuss and receive feedback from the public on disbursement options. A spending plan was developed that allocated the majority of disaster funds to direct payments to industry ($22.8 million) to build resiliency within the fisheries. The remaining amount will be used for mitigation ($2.6 million) to help plan and prepare for future domoic acid events. The disaster funding is expected to be received in early 2019.

For the first time, a contract to facilitate the Dungeness Crab Task Force was managed by staff using funds from the Dungeness crab trap limit account. The contract allowed for continued administration of the task force, participation in a task force meeting, and a tour of Northern California ports in October. During the port tour, staff were able to meet with the Dungeness crab fleet to discuss recent changes to the fishery with the passage of the Dungeness crab urgency bill (SB1310) and the fisheries omnibus bill (SB1309). Based on feedback received during the port

tour, staff prepared several "frequently asked questions" documents that include the information on disaster relief, vessel length restrictions, and changes to fair start rules due to domoic acid-related season delays.

New legislation (SB 1309) authorized CDFW to implement a program for the retrieval of lost or abandoned commercial Dungeness crab trap gear left in the water once the fishing season has ended. Staff worked with individuals participating in a pilot retrieval program, the Dungeness Crab Task Force, and the Dungeness Crab Fishing Gear Working Group to develop the regulations governing this program, which will be available for public comment in early 2019.

The start of the 2018-2019 Dungeness crab season was subject to closures and delays due to both domoic acid and poor results from meat recovery testing. Domoic acid was responsible for a recreational fishery closure in northern Humboldt and Del Norte counties and a commercial fishery delay from Bodega Head to the Sonoma-Mendocino county line from November 15 until December 8. The CDFW Director announced several meat recovery delays for the northern management area with a final date set for January 15, 2019, the latest the area can be delayed due to poor meat recovery test results. At the time of this report, it is unclear when the two remaining areas in Northern California, which continue to test high for domoic acid, will open to fishing.

For more information about Dungeness crab, visit the CDFW website at wildlife.ca.gov/Crabs.

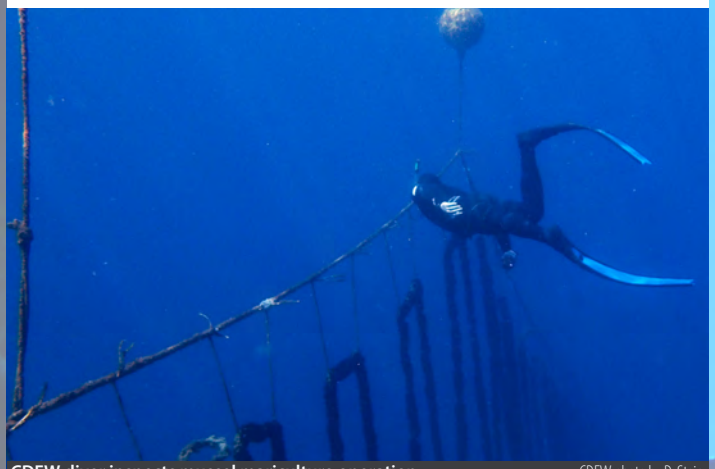
Bull kelp CDFW photo by R. Flores-Miller

Kelp and Other Marine Algae Management

Staff continued work on the commercial kelp and other marine algae rulemaking, including identifying areas for potential changes, presenting updates to the California Fish and Game Commission's Marine Resources Committee, and meeting with the InterTribal Sinkyone Wilderness Council to discuss input and concerns.

Staff provided review and feedback on various permits and projects involving kelp and marine algae, including Letters of Authorization, Wild Broodstock Collection Permits, Scientific Collecting Permits, and commercial kelp harvest plans and kelp bed lease renewal applications. Staff also participated in several working groups and broader collaborative efforts focusing on kelp during 2018. For example, the Greater Farallones National Marine Sanctuary and CDFW Kelp Recovery Working Group developed recommendations that were approved by the Sanctuary Advisory Council in November. Staff also participated in a Monterey Bay National Marine Sanctuary Advisory Council panel discussion on purple sea urchins and kelp restoration activities, and collaborated with The Nature Conservancy on advancing kelp conservation and science in California.

For more information about kelp and other marine algae, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/Kelp.



CDFW diver inspects mussel mariculture operation CDFW photo by D. Stein

Marine Aquaculture

Staff processed, reviewed, and approved 59 Live Importation Permits, 60 Aquaculture Registrations and nine Restricted Species Permits. Staff also prepared four Budget Change Proposals, three Private Stocking Permits, and four Letters of Authorization.

In collaboration with the State Shellfish Pathologist, State Aquaculture Coordinator, and Director's Aquaculture Disease Committee, staff worked to develop a management response to a newly discovered micro-variant of the oyster herpes virus in San Diego Bay.

Staff completed a survey and summary analysis of 110 acres of aquaculture gear on the 12 state-administered waterbottom leases in Tomales Bay. The results of this study informed the financial surety requirements for

those leases and were distributed to the California Coastal Commission and NOAA Fisheries. Staff worked with the California Coastal Commission to address issues related to gear and infrastructure on a subset of the Tomales Bay leases.

Staff assisted Humboldt Bay shellfish growers maintain compliance with permitting requirements regarding the avoidance of disturbing spawning Pacific Herring.

Staff updated the state waterbottom lease spatial dataset (available on CDFW's MarineBIOS spatial data viewer at wildlife.ca.gov/Conservation/Marine/GIS/MarineBIOS).

Staff performed spatial analysis to determine interactions between lease infrastructure and eelgrass habitat in Tomales Bay, and worked with the Environmental Review Project to provide comments on a State Water Board 401 Certification for Tomales Bay Oyster Company.

Staff coordinated with the State Aquaculture Coordinator and California Fish and Game Commission staff on several administrative and oversight activities related to the state's shellfish aquaculture leases, including: 1) discussion of shellfish aquaculture best management practices and regulations; 2) evaluation of shellfish aquaculture methods through reconciliation of regulatory language; 3) renewal of Santa Barbara Mariculture's state water-bottom lease; and 4) receipt and consideration of Santa Barbara Sea Ranch's new lease application off the coast of Santa Barbara.

For more information about marine aquaculture, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/ABMP/Aquaculture and wildlife.ca.gov/Aquaculture.

White Seabass release in Dana Point Harbor CDFW photo by K. Johnson

Ocean Resources Enhancement and Hatchery Program (OREHP)

CDFW, in collaboration with California Sea Grant, released the OREHP Evaluation Report. The report was the result of an extensive multi-year evaluation by an independent Scientific Advisory Committee and included a suite of recommendations for better meeting the OREHP's objectives and goals. To help inform CDFW and the Ocean Resources Enhancement Advisory Panel in their discussions of the evaluation, CDFW partnered with California Sea Grant to gather public opinion on the social values and potential direction of the OREHP from public stakeholder groups in Southern California.

CDFW and California Sea Grant facilitated three town hall meetings to provide an opportunity for stakeholders to comment on the evaluation report's results and recommendations, as well as the future direction of the OREHP. CDFW also accepted written comments from those who were unable to attend the town hall meetings. Preferences for the future of the OREHP varied among stakeholder groups. Most participants expressed interest in continuing the OREHP in some form, whether with White Seabass or another species, particularly California Halibut. Discontinuation of the OREHP was also mentioned by some, with a preference for using collected funds for other efforts that may benefit fisheries and ocean health rather than hatchery operations. CDFW and the OREHP will use the results of the evaluation along with public input to guide the OREHP's next steps and to decide on the future direction of the program.

For more information about the OREHP, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/ABMP/OREHP.

Offloading Pacific Hagfish from a commercial vessel CDFW photo by T. Tanaka

Pacific Hagfish

In 2018, program staff sampled Pacific Hagfish (hagfish) fishery from Port San Luis, Morro Bay, Moss Landing, and Eureka. Since 2007, despite market demand fluctuations, commercial landings for hagfish have remained relatively stable and have ranged from one to two million pounds annually. Market orders from

Korean importers improved over last year, with hagfish dealers taking all the fish provided by fishermen. However, with the increased demand, ex-vessel price did not increase. While California-caught hagfish are normally exported live to Korea, exporters are experimenting with packaging frozen hagfish. Effort and demand are driven by external market conditions such as the South Korean economy and the fishing activities of Oregon and Washington. Local factors such as bait supply and fuel costs also influence fishing effort.

For more information on Pacific Hagfish, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/NCCFRMP/Hagfish-Studies.

Pacific Herring research on foggy San Francisco Bay CDFW photo

Pacific Herring

Fishery management plan (FMP) development continued for California's Pacific Herring (herring) fishery in 2018. Through the year, staff worked closely with the FMP Project Management Team on drafting and editing the FMP. Staff also coordinated with California Ocean Science Trust for an external, independent peer review of the scientific and technical merits of the proposed management strategy, including the harvest control rule framework and essential fishery information. Progress continued on developing ecosystem indicators that will be used to inform the harvest control rule for inclusion in the final FMP, which will likely be presented to the California Fish and Game Commission in 2019.

Staff completed their annual population estimates for herring in San Francisco Bay. Sampling efforts included trawl and egg deposition surveys, as well as coordination with the San Francisco Bay Herring Research Association to continue collaborative research. The 2017-2018 herring season in San Francisco Bay ended with a below average spawning biomass estimate of 15,300 tons. The historical average is 48,500 tons (1979-present), and this was the fourth consecutive year of below average herring returns. There were 14 spawn events through the season starting in mid-December 2017 and ending in mid-March 2018. The largest spawn event occurred along the San Francisco waterfront in January, which involved an estimated 5,783 tons of herring. Staff also monitored the herring spawning population in Humboldt Bay and Crescent City Harbor, documenting and mapping five and two spawn events, respectively.

The total fishery quota for San Francisco Bay was set at 834 short tons for the 2017-2018 season. Nine commercial fishing vessels participated and landed 611 short tons of herring in San Francisco Bay. The herring fisheries in the northern management areas, Tomales Bay, Humboldt Bay and Crescent City Harbor, remained inactive with quotas set at 350, 60, and 30 short tons, respectively.

For more information about Pacific Herring, visit the CDFW website at wildlife.ca.gov/Fishing/Commercial/Herring and the CDFW Pacific Herring Management News blogsite at cdfwherring.wordpress.com.

Razor Clams CDFW photo

Razor Clams

2018 marked a second year that the recreational razor clam fishery was closed in both Humboldt and Del Norte counties due to high levels of domoic acid. In Humboldt County, staff collected clams on nine different days between January and November while volunteers in Del Norte County conducted six clam collections between January and August. At least one clam from all sampled areas consistently tested at or above the alert level for domoic acid at 20 parts per million. All 11 razor clams sampled in mid-November were found to exceed the action level and ranged in concentration from 130 to 300 parts per million. For

more information about clams, visit the Marine Region website at wildlife.ca.gov/Conservation/Marine/Invertebrates/Bivalves. For more information about finfish and shellfish health advisories, visit the Marine Region website at wildlife.ca.gov/fishing/ocean/health-advisories.

R/V *Mystinus* CDFW photo by D. Osorio

Research Vessel Operations

The number of vessels in the Marine Region's research fleet remained unchanged at 15 in 2018, but fleet capabilities were greatly improved. Last year's initiative to enhance capacity culminated in the delivery of one repowered vessel and two new replacement vessels to the fleet. The upgrades and acquisitions were made with support from the California Ocean Protection Council. The new workboats are efficient, reliable, and will make significant contributions to research and monitoring.

R/V *Irish Lord* – This 32-ft. fiberglass workboat originally built in 1987 was repowered with clean, efficient, and reliable outboard engines. The fuel tanks were replaced, and the work deck was reconfigured to improve capacity and workflow. The R/V *Irish Lord*'s home port is Ventura.

R/V *Megathura* – The 21-ft. fiberglass workboat was constructed by Parker Marine in 2018. This day-boat can support four divers and conduct trap surveys and light oceanographic work. Since delivery in June, it has supported dive surveys to monitor warty sea cucumber abundance around the northern Channel Islands. The R/V *Megathura*'s home port is San Diego.

R/V *Mystinus* – The 29-ft. R/V *Mystinus,* constructed in 2018 by Don Radon Boat Building in Goleta, was purchased with funding from the California Ocean Protection Council in May 2018. Designed as a short-range dive platform with a capacity of six divers, it can also support hook-and-line and trap surveys, light oceanographic work, and remote sensing. The R/V *Mystinus* deployed for 20 field days and more than 200 dives during its inaugural first season from July through October.

R/V *Garibaldi* – The 45-ft. flagship of the Marine Region, based in San Pedro, assisted in a variety of CDFW research studies as well as collaborative studies from San Diego to Point Conception, including the Channel Islands. The vessel was at sea for 118 days on 33 cruises, traveled 3,748 nautical miles, and used 5,539 gallons of fuel. The R/V *Garibaldi* was out of service for four weeks during the year to reinstall an A-frame, trawling winch, and to replace the auto pilot. During this time, other additions and modifications were made to enable the vessel to trawl.

State record Calico Surfperch CDFW file photo

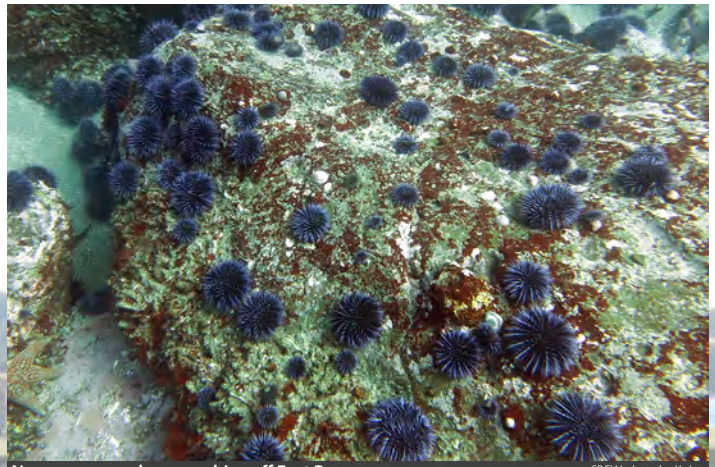
Saltwater Angling and Diving Records

Five new saltwater angling and diving records were accepted in 2018 (previous records in parenthesis):

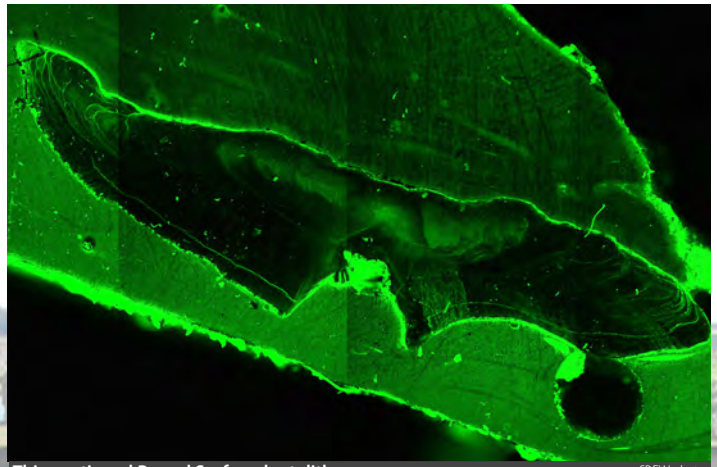
Calico Surfperch angling record: 1 lb. 15 oz. (1 lb. 14 oz.)
Grass Rockfish diving record: 6 lb. 7 oz. (6 lb. 3 oz.)
Vermilion Rockfish diving record: 10 lb. 10 oz. (10 lb. 6 oz.)
Canary Rockfish diving record: 3 lb. 4 oz. (this is a new species for the diving record category)
Dolphinfish (dorado, or mahi mahi) diving record: 28 lb. 0 oz. (24 lb. 4 oz.)

For more information about record saltwater fish and invertebrates, visit the CDFW website at wildlife.ca.gov/Fishing/Ocean/Records.

Marine Region research vessel capabilities were greatly improved in 2018.



Numerous purple sea urchins off Fort Bragg CDFW photo by K. Joe



Thin-sectioned Barred Surfperch otolith CDFW photo

Sea Urchin

In recent years, purple sea urchins have become so numerous throughout Mendocino and Sonoma counties that food resources for abalone have become greatly reduced, causing starvation conditions for abalone. With increased public interest in reducing purple sea urchin numbers, CDFW staff recommended, and the California Fish and Game Commission adopted, an increase in the recreational daily bag limit from 35 urchins (the general invertebrate bag limit) to 20 gallons for Mendocino and Sonoma counties. This higher bag limit was quickly utilized at several purple sea urchin harvest events at Ocean Cove, Albion Cove and Caspar Cove, coordinated by the Watermen's Alliance and sampled by CDFW. Data from these efforts supported a request by stakeholders that the California Fish and Game Commission increase the bag limit for purple urchins from 20 gallons to 40 gallons in 2019.

Staff have also been key in the formation of the Kelp Ecosystem and Landscape Partnership for Research and Resiliency program (or *KELPRR*) which has drawn more than a dozen partners from agencies, academia, sport diver organizations, environmental groups, and the fishing industry. The organization is addressing the problems caused by the recent explosion in purple sea urchin numbers and how to restore Northern California kelp forests. KELPRR partners are developing ecosystem monitoring programs, educational materials, and options for use of harvested urchin materials. For more information about sea urchin, visit the Marine Region website at wildlife.ca.gov/Conservation/Marine/Invertebrates/Sea-Urchin.

Public interest spurred efforts to reduce purple sea urchin numbers in 2018.

Surfperch and Other Surf Fishes

Staff continued to monitor surfperch commercial and recreational hook-and-line fisheries in Central and Northern California. Barred Surfperch and Redtail Surfperch continued to dominate commercial landings and the recreational catch. The Morro Bay port complex is the hub of the Barred Surfperch commercial fishery while Redtail Surfperch are landed primarily in Eureka. Preliminary 2018 statewide Barred Surfperch and Redtail Surfperch annual commercial landings indicate catches were slightly above 10-year averages. Neutral to favorable oceanographic conditions following the 2014 to 2016 El Niño event continued in 2018.

Staff continued collecting essential fishery information using fishery-independent surveys with hook-and-line gear from San Luis Obispo County to Mendocino County, and completed progressive angler surveys to document angler effort along Monterey County sandy beaches. Since 2007 approximately 1,300 fishery-independent surveys have been completed by staff and more than 16,900 anglers have been documented during approximately 500 progressive angler surveys.

In collaboration with San Francisco State University, the lab analysis portion of an age validation study was completed for Barred Surfperch treated with oxytetracycline, an otolith marker. A fluorescence laser microscope was used to observe and photograph the otoliths after they were thin-sectioned and mounted on slides. The photos are being examined and measured digitally using Fiji ImageJ software to validate the whole-otolith ageing method.

Staff began developing a management strategy evaluation for Redtail Surfperch in conjunction with the Data Limited Methods Toolkit project. Staff built an operating model for both the recreational and commercial beach fisheries for this species and began evaluating the effects of applying a wide range of management

scenarios to this virtual fishery into the future.

Staff continued to analyze data from the surf fish beach seine study. Preliminary results showed no strong relationships between most environmental factors including temperature, tide height, and tidal flux (incoming vs. outgoing) and fish abundance for each of the project species (Barred Surfperch, Walleye Surfperch, California Corbina, Spotfin Croaker, Yellowfin Croaker).

For more information about surfperch and surf fish studies, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/NCCFRMP/Surfperch-Studies and wildlife.ca.gov/Conservation/Marine/SCFRMP/SurfFish.

Preliminary commercial landing totals for Night Smelt show a 24 percent increase over 2017.

True Smelt

Preliminary commercial Night Smelt landings totaled 219,494 pounds in 2018, increasing 24 percent from 2017. Surf Smelt or "day fish" landings increased slightly from an all-time low of 688 pounds in 2017 to 1,654 pounds in 2018. Historically, both species were targeted in California from Monterey County to the Oregon border; however, the majority of the landings originate in Northern California. These fisheries, commercial and recreational, are shore-based and fishermen use A-frame dip nets for taking Night Smelt and Surf Smelt, while cast nets are also used for Surf Smelt.

For more information about true smelts, visit the CDFW website at www.wildlife.ca.gov/Conservation/Marine/NCCFRMP/True-Smelts

Catching Surf Smelt with an A-frame dip net CDFW photo by K. Lesyna

Warty sea cucumber amid feather stars CDFW/MARE photo

Warty Sea Cucumber

Staff implemented the first commercial seasonal closure to protect spawning groups of warty sea cucumber. The closure, which spans 3½ months from March 1 -June 14 was adopted by the California Fish and Game Commission in 2017 and went into effect for the 2018 season. Staff completed the fifth consecutive year of dive and laboratory research to collect essential fishery information for warty sea cucumber populations at the northern Channel Islands. Staff performed seasonal dive surveys at six different locations (inside and outside of marine protected areas) to measure seasonal changes in densities and to characterize size distributions. This is the first fishery in California where essential fishery information from within MPAs is being actively used for management. To date, more than 4,000 warty sea cucumber have been enumerated and measured, with an additional 2,201 individuals collected and dissected. Data collected by CDFW during this year's first seasonal closure suggest that spawning aggregations were largely protected by the closure period. A collaborative investigation using a remotely operated vehicle was also performed in spring and fall of 2018 with Marine Applied Research and Exploration to examine the seasonal depth distribution of warty sea cucumber during spawning and non-spawning periods. The information collected by this remotely operated vehicle research will assist in evaluating the degree to which populations use shallow depths for reproductive purposes and the role that deeper depths may play in providing refuge to warty sea cucumber, which are primarily targeted by divers. In addition, this information will assist in assessing the effectiveness of current CDFW surveys in monitoring populations of warty sea cucumber. For more information about the collaborative warty sea cucumber remotely operated vehicle density study, read the MPA Management Project newsletter.

White Seabass school near Anacapa Island CDFW/MARE photo

White Seabass

Staff continued to collect samples for a study updating the age at maturity for White Seabass. Collaborating with sport fishermen, staff collected an additional 11 samples and 42 individual fish. Collecting fish within the size range needed has been very challenging, but staff anticipate a stronger sampling season in 2019 with the help of additional staff members targeting fishing trips in the Santa Barbara area.

Staff collected and analyzed commercial and recreational data as part of the annual review of the White Seabass Fishery Management Plan for the 2017-2018 season. Staff evaluated the numbers and sizes of White Seabass landed, information on forage fish availability, and socioeconomic data to determine if points of concern had been met. None of the five main points of concern were met for the season and no further action was needed.

For more information about White Seabass, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/NCCFRMP/White-Seabass and wildlife.ca.gov/Conservation/Marine/SCFRMP/White-Seabass.

State/Federal Marine Programs

These programs are responsible for fisheries jointly managed by state and federal entities.

Bin of rockfish offloaded from a commercial vessel CDFW photo by J.B. Batten

Groundfish

Management and Research – California's sport and commercial groundfish fisheries (which include more than 90 species of rockfish, roundfish, ratfish, skates and sharks) remained within prescribed annual catch limits and accountability measures in 2018 due to active monitoring and management by state and partner agencies and stakeholders.

The regulatory activities for the 2019-2020 groundfish fisheries were finalized in 2018. These resulted in several increased opportunities for California's sport and commercial fisheries, due in part to nearly all overfished stocks being declared rebuilt, and more optimistic stock assessments for Yelloweye Rockfish and Cowcod — two overfished species that continue to limit access to healthy stocks. For Yelloweye Rockfish, less restrictive annual catch limits were implemented for 2019 due to a more positive stock status outlook in the most recent assessment, and the continuing need for stability in groundfish fishing opportunities for California's coastal fishing communities. For Cowcod, due to the stock being projected to be rebuilt by 2019, staff was able to document that there would be low risk to the stock if the annual catch target and allowable fishing depths were increased.

However, not all the new stock assessment information was optimistic, as the Lingcod stock assessment off California was found to be in the precautionary zone. Consequently, recreational anglers in much of California will face a reduced bag limit from two fish to one fish in 2019, while commercial fishermen will experience a reduction in their vessel-based trip limits. Staff answered questions and responded to numerous comments about the new science and management actions during the 2018 state and federal regulatory processes which implement these reductions, and conducted a number of outreach efforts.

Staff also completed a California Fish and Game Commission regulation change package that will apply the new federal recreational groundfish fishing regulations for 2019 and 2020 in state waters.

In collaboration with federal agency partners and nongovernmental organizations, staff participated in developing recommendations for essential fish habitat for groundfish, and adjustments to the trawl rockfish conservation areas, which are depth-based closures to protect overfished species. The goals were to minimize adverse effects on sensitive habitat that can occur when fishing with trawl gear, to allow increased access to productive fishing grounds, and to increase resource-use efficiency.

Staff provided analyses to inform two Endangered Species Act biological opinions related to take of listed salmon in the Pacific Coast groundfish fishery and the Pacific Halibut fishery. Staff also developed management measures to implement the federal Incidental Take Statements for California fisheries. Staff also participated in reviews of Eulachon and seabirds, other Endangered Species Act-listed species that are taken in the groundfish fishery.

Staff reviewed, supported, and recommended terms and conditions for several new federal Experimental Fishery Permits that will commence in 2019. One will authorize new commercial midwater trawl fishery activities off California, while others have the goal of developing a midwater hook-and-line commercial fishery targeting underutilized midwater rockfish species.

Staff completed a regulation change package for state logbook requirements that the California Fish and Game Commission adopted on December 12, 2018. Starting April 1, 2019, commercial fishermen participating in the federally-managed groundish trawl fishery will no longer be required to fill out state logbooks.

Staff continue to lead efforts to evaluate visual survey data collected from nearshore waters during remotely operated vehicle studies. Developing a fishery-independent method for determining groundfish abundance in nearshore waters has the potential to

enhance future stock assessments.

Education and Outreach – Staff participated in the biennial Western Groundfish Conference held in February in Santa Cruz by contributing to the planning committee and presenting information about barotrauma in rockfish and the benefits of using various types of descending devices in the recreational groundfish fishery.

With help from CDFW's California Recreational Fisheries Survey project, staff completed 23 outreach assignments during season-opening weekends in the Northern, Mendocino, San Francisco and Central recreational groundfish management areas. Staff provided anglers with more than 400 packets containing the 2018 recreational groundfish regulations, species identification flyers, and information on the CalTIP program. Staff also distributed more than 160 descending devices.

Staff prepared a number of groundfish-related press releases and blog posts in 2018 and maintained and updated several CDFW web pages and our recreational groundfish phone hotline throughout the year.

Visit the CDFW website at wildlife.ca.gov/conservation/marine/groundfish for more information about groundfish.

Offloading commercially-caught Pacific Halibut CDFW photo by J.B. Batten

Pacific Halibut

CDFW continues to actively manage the recreational Pacific Halibut fishery in California waters. Based on projected early attainment of the 2018 California quota, an in-season fishery closure was implemented on September 21, 2018, following discussions with the International Pacific Halibut Commission, Pacific Fishery Management Council and National Marine Fisheries Service. Final 2018 recreational catch estimates totaled 31,156 net pounds – or 101 percent of the quota. The average net weight per kept fish in 2018 was approximately 24 pounds, the highest in the last ten years.

In 2018, four commercial vessels participated across three of the opening days in the directed fishery; the preliminary landings were 2,457 net pounds. The landings were made into the port of Eureka and sale of the fish produced an estimated $17,800 in ex-vessel revenue for Northern California coastal communities. CDFW staff were present at the offloads to conduct biological sampling in coordination with the International Pacific Halibut Commission's commercial fishery sampling program. Visit the CDFW website at wildlife.ca.gov/Conservation/Marine/Pacific-Halibut for more information about Pacific Halibut.

Collecting data on commercially-caught tuna CDFW photo by M. Horeczko

Pelagic Fisheries and Ecosystems

Highly Migratory Species – Involvement in the Pacific Fishery Management Council (Council) process required substantial contributions this year from Marine Region Highly Migratory Species (HMS) Management Project staff representing CDFW in high-priority issues on the HMS Management Team. Team members participated in numerous meetings and contributed reports to support decisions regarding deep set buoy gear, a new commercial gear type to sustainably target swordfish off the West Coast, and adoption of a new methodology for determining bycatch performance metrics in the large-mesh drift gillnet fishery. Staff also contributed to the dynamic management needs for international stocks important to commercial and recreational fisheries such as Pacific Bluefin Tuna and North Pacific Albacore Tuna.

HMS Project staff completed another year of in-season catch monitoring for Pacific Bluefin Tuna and other tunas and expanded commercial dockside Pacific Bluefin Tuna sampling to include smaller volume landings in the hook-and-line and gillnet fisheries. Hundreds of Pacific Bluefin Tuna genetic samples were collected, contributing to a Pacific-wide population study.

Staff continued to improve HMS data quality, revising and enhancing automated error checking through the Commercial Landings Data Improvement Process database management system. The HMS team also coordinated with CDFW's Law Enforcement Division to improve data tools that review permitting and license compliance, and participated in a multi-agency collaborative team to improve and coordinate federal and state HMS data quality, product development and standardization for the Eastern and Tropical Pacific.

Federal Ecosystem Planning – The Marine Region supported the Council's Ecosystem Work Group, participating in climate change scenario planning for the West Coast and initiating a five-year review of the Pacific Coast Fishery Ecosystem Plan for the U.S. portion of the California Current Large Marine Ecosystem. The review consists of revising and updating the goals and objectives of the Council's Fishery Ecosystem Plan to be more specific and measurable, as well as developing an outline of revisions to the plan that reflect updated science and the results of Fishery Ecosystem Plan initiatives.

Coastal Pelagic Species – The Coastal Pelagic Species (CPS) Management Project continued to engage in federal fishery management as members of the Council's CPS Management Team. The team held meetings throughout the year and prepared various reports. Importantly, this work supported the CPS Fishery Management Plan amendment processes for the live bait fishery, setting harvest specifications for Pacific Sardine, evaluating Northern Anchovy management status, and approving exempted fishing permits to provide CPS stock assessment information.

CDFW was a partner in the California Pelagic Species Aerial Survey, which started in 2012 as a collaborative effort with the California Wetfish Producers Association. In addition to regular surveys, staff participated in the California Wetfish Producers Association summer nearshore collaborative survey with NOAA Fisheries, conducting sampling aboard purse seine vessels.

Staff continued dockside commercial CPS fisheries sampling, collecting 97 samples and ageing 575 otoliths for use in stock assessments.

The CPS Management Project participated in various outreach activities, including meetings with the commercial live bait industry and attending the annual California Wetfish Producers Association meeting.

Visit the CDFW website at wildlife.ca.gov/Conservation/Marine/Pelagic for more information about the pelagic fisheries and ecosystem management.

Sport-caught Chinook Salmon at Noyo Harbor, Fort Bragg CDFW photo

Salmon

At the beginning of the 2018 ocean salmon management cycle, project staff conducted the annual California Ocean Salmon Information Meeting, which attracted about 120 interested stakeholders. Staff provided information on 2017 ocean salmon fisheries, spawning escapement, stock-specific abundance forecasts, and the outlook for 2018 sport and commercial ocean salmon fisheries. Members of the public provided input to a panel of California salmon scientists, managers, and representatives for consideration in the development of 2018 ocean salmon regulations.

Project staff involved on the Klamath River Technical Team coordinated with federal, tribal, and other state agencies to consolidate and summarize catch and other survey information on Klamath River fall Chinook for use in the 2018 management cycle.

Staff participated in the process of drafting 2018 ocean salmon seasons with the Pacific Fishery Management Council and worked together with the

Genetic samples were collected from hundreds of Pacific Bluefin Tuna as part of a Pacific-wide population study.

California Fish and Game Commission and CDFW staff to implement a process to automatically conform sport ocean salmon regulations to federal regulations. Staff produced the *Review of 2017 Ocean Salmon Fisheries* report and several other pre-season reports in collaboration with federal, tribal, and other state agencies. These documents included information on ocean harvest, inland escapement, abundance forecasts, regulatory season alternatives, and final ocean salmon fisheries regulations.

In 2018, a new harvest control rule was implemented to regulate the impact of fisheries on endangered Sacramento River winter Chinook. Project staff participated on an ad-hoc winter run work group in a two-year effort to update the harvest control rule. The updated harvest control rule is expected to be more responsive to changes in abundance because it uses forecast escapement rather than past year averages.

Also new in 2018, after three years of poor spawner returns, both Sacramento and Klamath River fall Chinook met overfished criteria, as established in the Pacific Coast Salmon Fishery Management Plan. Project staff, in collaboration with other agencies, began drafting rebuilding plans for these two stocks. The plans review potential causal factors leading to the overfished status, and specifically assess the roles that freshwater conditions, marine conditions, harvest, and fishery management may have played. Findings from these plans will be used to identify habitat issues hindering salmon survival, and may also be used to guide fishery management until rebuilt status is achieved. The public will have an opportunity to review these rebuilding plans in early 2019.

Due to the overfished status of Sacramento River fall Chinook and uncertainty around its abundance, the Pacific Fishery Management Council took extra precautions to minimize impacts to this essential stock during the 2018 season. As a result of cooperation between industry representatives and regulatory bodies, fishing seasons were curtailed in many months and in most areas, to reduce fishery impact rates on this depressed stock and ensure higher future escapement levels.

During the ocean salmon fishing season, recreational and commercial fisheries were monitored at approximately 20 ports along the California coast. In the commercial fishery, staff sampled approximately 25,800 salmon and collected snouts from more than 7,000 adipose fin-clipped salmon for subsequent coded-wire tag processing. In the recreational fishery, field staff coordinated with CRFS staff in contacting nearly 24,700 anglers to sample more than 24,200 Chinook Salmon and collect approximately 5,600 heads from adipose fin-clipped salmon. Staff utilized these sample data to produce annual ocean catch and effort estimates by fishery, management area, and half-month period. In conjunction with normal dockside sampling, nearly 3,500 tissue samples were collected in 2018 for a pilot project aimed at investigating the feasibility and utility of conducting genetic analyses to supplement stock composition data from coded-wire tags.

Staff processed approximately 13,100 coded-wire tags from fish caught in the ocean salmon fisheries and uploaded these data, along with their respective catch-sample data, to a publicly accessible data warehouse called the Regional Mark Processing Center. These data are used to determine stock contributions and fishery impacts— information needed to sustainably manage West Coast fisheries and protect California salmon stocks.

Project staff continued work on Constant Fractional Marking analyses, and the results have been published to the Ocean Salmon Project website. Staff completed the 2013 Constant Fractional Marking report this year, and the 2014 report will be available shortly. These reports detail hatchery contributions to inland harvest, escapement, and ocean fisheries, and describe the effects of various hatchery release types, most notably recovery and stray rates. Constant Fractional Marking results will be used widely to evaluate and modify hatchery programs, bay and coastal net pen programs, barge studies, restoration activities, recovery goals, and salmon life cycle model calibrations.

Staff responded to 127 public inquiries received through the Ocean Salmon Courtesy Request Program. Recreational anglers and commercial trollers may request information about their adipose fin-clipped salmon that are sampled by project staff in the field.

Visit the CDFW website at wildlife.ca.gov/OceanSalmon for more information about ocean salmon management and seasons.

Resource Assessment Programs

These programs are responsible for collecting and disseminating recreational and commercial fishery-dependent data.

Scientific aid collects information from a recreational fisherman CDFW photo

CRFS data and estimates are essential for managing California's diverse marine fisheries.

California Recreational Fisheries Survey (CRFS)
CRFS field operations are supported by 15 permanent staff and, on average, 65 temporary Fish and Wildlife scientific aids. Annually, CRFS collects data on the catch of more than 100,000 anglers and examines more than 190,000 of the retained fish and invertebrates. In 2018, CRFS conducted several thousand private and rental boat surveys at launch ramps, piers, jetties and breakwaters, and party/charter boat dockside surveys. During these assignments, CRFS samplers collected data on angler effort, demographics, and catch, and collected biological measurements on recreationally caught finfish. CRFS also conducted party and charter boat onboard assignments to collect additional data on fishing location and discarded finfish.

In 2018 CRFS, in collaboration with the Recreational Fisheries Data Project, designed and implemented two beach and bank pilot studies to estimate effort and catch. The new catch rate survey was designed based on recommendations from a national review of CRFS methods in 2011. The survey implemented weighted probability sampling to increase the precision of the estimates and to lower survey costs. Preliminary results show a 20 percent increase in the number of angler interviews with anglers who had completed a fishing trip, using the same level of staffing as the legacy survey. CRFS conducted hundreds of beach and bank catch rate surveys along California's 1,100 miles of coastline. CRFS staff entered the data collected during the field surveys and the pilot studies into the CRFS data system (*see* Recreational Fisheries Data Project, *pg. 21*).

California Recreational Fisheries Survey Outreach – CRFS field staff provide outreach to the recreational fishing community by sharing informational materials on sportfishing regulations, species identification, marine protected areas, barotrauma and the use of descending devices, whale entanglement, and domoic acid.

For more information about the California Recreational Fisheries Survey, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/CRFS.

Commercial fishing vessel at sea CDFW photo

Marine Fisheries Statistical Unit
Staff collects, processes, and audits commercial fishery landings data, including landing receipts, commercial passenger fishing vessel logbooks, spiny lobster logbooks, and transportation receipts. Staff design, order, and distribute all paper landing receipts and commercial passenger fishing vessel logs for constituents. Marine Fisheries Statistical Unit staff also process all commercial fishery data requests received from commercial fishing license holders and other authorized requestors.

Recreational saltwater fisherman CDFW photo by E.W. Roberts III

Pacific Recreational Fisheries Information Network (RecFIN)

Marine Region submits California Recreational Fishery Survey (CRFS) estimates to RecFIN on a monthly basis. RecFIN provides a centralized data system to house recreational fisheries information from California, Oregon, and Washington. CRFS and the Recreational Fisheries Data Project staff represent California on the RecFIN Technical Committee, Data and Technology Subcommittee and the Statistical Subcommittee. Through these committees, staff support RecFIN efforts to coordinate the coastwide collection of marine recreational finfish data and procedures for estimating catch, effort and participation. CRFS and the Recreational Fisheries Data Project also collaborated with RecFIN programmers on validating estimates and routines in the new RecFIN database, which was launched in spring 2017. RecFIN enhancements for CRFS data and estimates continued through 2018 and are expected to continue into 2019. For more information about RecFIN, visit the website at www.recfin.org.

CRFS data is used to monitor Yelloweye Rockfish catches CDFW/MARE photo

Recreational Fisheries Data Project

The Recreational Fisheries Data Project and CDFW's Data and Technology Division staff continued to develop and maintain a data system for CRFS catch, effort, biological, and spatial data and estimates.

The system includes a centralized relational database to store information, a data entry system with built-in error checks, validation routines to improve data accuracy, and automated reports. The data system increases CDFW efficiency, improves data accuracy and provides the flexibility to align data capture with changing management needs.

CRFS data and estimates are essential for managing California's diverse marine fisheries. CDFW, the California Fish and Game Commission, the Pacific Fishery Management Council, the International Pacific Halibut Commission and the National Marine Fisheries Service used CRFS data and estimates for fishery management in 2018. These uses included: in-season monitoring for species of concern such as Cowcod, Yelloweye Rockfish and Pacific Halibut; developing harvest guidelines; conducting regulatory analyses, and making other critical management decisions. CRFS data were also used in the Marine Protected Area Monitoring Action Plan to examine historical recreational fishing effort across the State as well as local fishing mortality.

Statistical and Technical Support – Recreational Fisheries Data Project staff provided statistical and technical assistance to various projects in support of the management and restoration of fish stocks. These included:

- Providing CRFS data, estimates, and data summaries to various CDFW projects, stock assessors, university researchers, graduate students, the Pacific Recreational Fisheries Information Network (RecFIN), and other State and federal agencies
- Providing advice on use of CRFS data and estimates
- Providing statistical advice on survey design and developing estimation procedures for CRFS pilot studies. These studies are testing use of an online survey to collect recreational fishing effort data, and use of field surveys for collecting recreational catch rate and effort data on beaches and banks
- Providing statistical advice on data analyses for several CDFW research projects including a comparison of the total length of California Sheephead with corresponding fillet lengths
- Reviewing publications that used CRFS data and estimates

For more information about the Recreational Fisheries Data Project, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/Recreational-Fisheries-Data

Habitat Conservation Programs

Agreements for Sharing Confidential Data

Staff from CDFW's Marine Region, Office of the General Counsel, and Data and Technology Division worked together to incorporate State data security requirements into new data sharing agreements. Eight data-sharing agreements were approved to allow federal and academic fishery and socioeconomics scientists to incorporate confidential state fisheries data into their project analyses.

Intertidal monitoring site, Point Sur — CDFW photo by S. Worden

Climate Change Activities

Staff participated on the Advisory Group for the Coast and Ocean Summary Report that was published as part of California's Fourth Climate Change Assessment. Staff also provided updates to the Natural Resources Agency on CDFW's current status for actions included within the 2018 and 2014 Safeguarding California documents and the 2009 Climate Adaptation Strategy. Staff participated in several workshops that focused on climate-related topics: monitoring harmful algal blooms to inform seafood safety and fisheries management, integration of ocean acidification hotspots into management of California fisheries, and potential direct and indirect effects of climate change on fisheries and communities. Starting in August, staff also met monthly with individuals from the California Ocean Science Trust and the California Fish and Game Commission, and more recently the California Ocean Protection Council, to discuss the coordination of climate-related efforts. This group noted several federal and state efforts that focus on climate and fishing communities that would benefit from this synergism, and identified several associated objectives and tasks including a workshop to be hosted by the California Ocean Science Trust in 2019.

Staff participated on the Coastal Ocean Working Group of the State's Climate Action Team. Staff also represented West Coast fishery managers on the California Current Acidification Network steering committee.

Taking samples of mud shrimp in Humboldt Bay — CDFW photo by R. Garwood

Environmental Review and Water Quality Project

During 2018, staff in the Environmental Review and Water Quality Project continued to work on a wide variety of projects, permits, and statewide plans. Staff participated in more than 60 pre-project review meetings and reviewed over 600 environmental documents (plans, surveys, reports, permits, public notices, California Environmental Quality Act, California Endangered Species Act, etc.). The review effort included more than 120 California Environmental Quality Act documents, 90 U.S. Army Corps of Engineers Public Notices, 150 monitoring plans and reports, 40 invasive species survey reports, 85 permits from various agencies and over 50 scientific collection permits. Topics reviewed included: wave energy, desalination plant impacts, power plant impacts, dredging impacts, beach nourishment projects, contaminant site remediation, mitigation projects, California Endangered Species Act impacts, tribal concerns, State Water Resources Control Board policy review, artificial reefs, mitigation proposals, eelgrass restoration, invasive species control projects, Scientific Collecting Permits, aquaculture projects, alternative energy projects, and dock and pier construction impacts. In addition, staff participated

in the review and development of several U.S. Navy, U.S. Marine Corps and U.S. Air Force Integrated Natural Resource Management Plans.

Environmental Review and Water Quality Project Coordination and Collaboration – Staff worked closely with other agencies, applicants, and CDFW regions to coordinate environmental review activities. 2018 activities included:

- Participating on the Humboldt Bay Eelgrass Management Plan Team
- Participating on the CDFW Mitigation Banking Team
- Addressing sand mining, dredging and oyster shell harvesting impacts in San Francisco Bay as part of the San Francisco Bay Conservation and Development Commission
- Participating on the Statewide and Regional Coastal Sediment Management teams
- Participating on the Los Angeles Dredge Material Management Team
- Participating in the development of a monitoring plan to determine impacts to Longfin Smelt from hydraulic dredging operations in San Francisco Bay
- Participating as part of an internal working group to develop a mitigation plan for impacts associated with the Poseidon Desalination Facility in Carlsbad
- Completing Amendment No. 7 for Caltrans San Francisco-Oakland Bay Bridge Seismic Retrofit Project Incidental Take Permit
- Representing CDFW on the newly formed California Ocean Renewable Energy Taskforce
- Participating in several Department of Defense Integrated Natural Resource Management Plan reviews and meetings
- Participating at Beach Ecology Coalition meetings
- Helping to develop and implement structural changes to the CDFW-wide Scientific Collecting Permit program through both a rulemaking change and a new online application and reporting system.
- Developing an online survey for anglers and divers to better understand how artificial reefs are utilized by California's recreationalists.
- Coordinating eelgrass restoration and monitoring efforts with the Morro Bay National Estuary Program
- Completing the 2016-2017 Grunion Spawning Habitat Field Report
- Completing the Mission Bay Ferry Terminal and Water Taxi Project Incidental Take Permit

Marine protected area outreach CDFW photo by A. Van Diggelen

Statewide Marine Protected Area (MPA) Management Project

California is home to the largest ecologically connected network of MPAs in North America, including 124 MPAs and 14 special closures encompassing 16 percent of state waters. CDFW manages the MPA Network using a partnership-based approach through the MPA Management Program, which includes four core components: 1) outreach and education, 2) research and monitoring, 3) enforcement and compliance, and 4) policy and permitting. This approach ensures that the MPA Network is adaptively managed with active engagement across the ocean community to meet the goals of the Marine Life Protection Act.

Outreach and Education — Staff continue to focus on increasing public awareness to enhance compliance with MPA regulations. More than 14,600 guidebooks; 36,300 brochures; 7,500 posters; 1,300 logo stickers, and 400 information cards were distributed. These publications were shipped to 235 locations such as sporting goods stores, scuba and ecotourism groups, aquariums, schools, parks, campgrounds, harbors, non-profit businesses, commercial fishing enterprises, and various individuals. The guidebooks and brochures were also available online, through CDFW offices, and at special events.

To spotlight individual MPAs, staff continued writing articles for the Marine Management News blogsite series, *Exploring California's Marine Protected Areas*. Staff wrote an article that was published in the March-April issue of *Outdoor California*, *Crystal Cove: Exploring California's Undersea Wilderness off Orange County's Protected Wild Coast*, which featured a state marine conservation area. In addition, two new products were released in 2018, including an MPA educational video

Safeguarding an Underwater Wilderness and the MPA Management Project e-newsletter.

Through a cooperative partnership with the California Ocean Protection Council (OPC) and California Marine Sanctuary Foundation, interpretive and regulatory signs were developed and installed at key marinas, harbors, and other ocean access points throughout the state. To date, there are 450 signs installed statewide, with 33 "Interpretive Signs" that highlight individual MPAs, 11 "You Are Here" signs, 11 "No Fishing" signs, and four "Harbor" signs installed in 2018.

More than 15,600 students participated in the MPA Parks Online Resources for Teachers and Students program in 2018. More than 60,000 students have participated since this CDFW and California Department of Parks and Recreation partnership began in 2014. The program connects resource experts in the field with students in their classrooms, and core curriculum teaches students about the MPA Network. Modules have been created for Año Nuevo State Marine Reserve, Point Lobos State Marine Reserve, Crystal Cove State Marine Conservation Area, and Pyramid Point State Marine Conservation Area, that teach students about elephant seals, kelp forests, tide pool ecology, and the salmon lifecycle, respectively.

Research and Monitoring – The Marine Life Protection Act requires the MPA Network be monitored to evaluate progress toward meeting its goals, and that the results of monitoring inform adaptive management decisions. The vehicle for guiding research and monitoring activities across California's MPA Network is the MPA Monitoring Program. CDFW, OPC, and the California Fish and Game Commission collaboratively lead the MPA Monitoring Program, which includes two phases: 1) regional baseline monitoring and 2) statewide long-term monitoring.

Phase 1 concluded in February 2018, with data and results for the North Coast MPAs described in technical reports for eleven funded research projects and summarized in a "State of the Region" report. This information was used to develop an initial 5-year management review regarding regional MPA implementation. Phase 1 was completed in the Central Coast in 2013, the North Central Coast in 2016, and the South Coast in early 2017; all Phase 1 products are available on the CDFW website.

With the completion of Phase 1 for all four coastal planning regions, CDFW, OPC, and the California Fish and Game Commission began to develop Phase 2: long-term, statewide monitoring. To guide long-term monitoring, CDFW and OPC developed a MPA Monitoring Action Plan which was adopted by the California Fish and Game Commission and OPC in October 2018. Staff worked with partners to develop quantitative and expert approaches to inform the Action Plan, including co-mentoring three post-doctoral researchers from UC Davis. OPC approved $9.5 million for long-term monitoring projects, and released a solicitation for proposals and statement of qualifications on November 1, 2018. Projects will be selected based on their alignment with the Action Plan and will begin data collection in 2019 upon OPC's approval at their May 2019 meeting.

Staff continue to build cooperative working relationships with many of our partners by participating in more than 40 days in the field on research projects in 2018. Collaborators included The Partnership for Interdisciplanary Studies of Coastal Oceans, Reef Check California, the Multi-Agency Rocky Intertidal Network, Redwood National and State Parks – Redwood Creek Estuary, Monterey Bay National Marine Sanctuary, National Oceanic and Atmospheric Administration, National Parks Service, Channel Islands National Marine Sanctuary, Scripps Institution of Oceanography, and Vantuna Research Group. Staff also represented CDFW at more than ten MPA research and monitoring meetings and workshops, and made 19 presentations related to the management of the MPA Network.

Enforcement and Compliance – From January through June 2018, more than 11,000 MPA-related contacts were made by CDFW's Law Enforcement Division (LED) staff, resulting in 396 warnings and 222 citations.

Assembly Bill 2369 was signed by Governor Brown on August 24, 2018 and will go into effect January 1, 2019. This bill increases the fine amount for a commercial fishing violation (which includes commercial passenger fishing vessels/party boats) in an MPA to be consistent with other illegal-take-for-profit penalties.

Management program staff coordinated with LED to compile, analyze, and interpret LED citation data for the first five years of MPA implementation in the North Coast

MPA research staff and partners spent more than 40 days in the field in 2018.

MPA planning region (California-Oregon border to Alder Creek, near Point Arena). Coordination efforts continue for various MPA implementation activities to improve the enforcement and compliance of the MPA network, such as developing a records management system and clarifying MPA regulations to improve compliance.

Policy and Permitting – The MPA Statewide Leadership Team is an advisory body convened by OPC to ensure effective communication and collaboration among partner entities that have significant authority, mandates, or interests that relate to the MPA Network. A new Leadership Team Work Plan was approved in October by OPC, which defines priority actions in the four focal areas of the MPA Management Program over the next three fiscal years. The Work Plan outlines shared strategic priorities among the members of the Leadership Team and identifies key actions and outcomes related to the management of the MPA Network.

In August 2018, 17 California ocean stakeholders were selected by the International Union for the Conservation of Nature to hold evaluation meetings and site visits to assess how the MPA Network aligns with the International Union for the Conservation of Nature Green List program. If advanced to candidacy, California's MPA Network could be the first in the world added to the Green List as a collection of areas designed to function as a network.

CDFW and OPC's Science Advisory Team developed an ecologically based decision framework to estimate impacts of scientific collecting in MPAs. All scientific collecting permit applications requesting access to MPAs are now reviewed using this framework, which is also available online as a scientific journal publication. Using this framework, 70 individual Scientific Collecting Permits were issued for research within MPAs between January and November 2018.

As part of the adaptive management framework, the California Fish and Game Commission adopted two CDFW-recommended MPA regulatory packages in August 2018: 1) Repeal Rockport Rocks Special Closure, and 2) Permit tribal take in four MPAs (Kashtayit, Naples, Point Dume and Anacapa Island state marine conservation areas) and modify the boundaries of Stewarts Point State Marine Conservation Area and Stewarts Point State Marine Reserve.

For more information about California's MPAs, please visit the CDFW website at wildlife.ca.gov/MPAs.